Magic 5000 digital

Digital Ultrasound System

OPERATION MANUAL

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(We reserve the right to make changes to the user manual.)

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Chapter 1 General Description

1.1 Product introduction

- EICKEMEYER Magic 5000 digital is a portable digital ultrasonic diagnostic B/W system adopting the fully digital beam-former technology, which owns excellent upgradeable property. Its digital design enables the system to the maximum flexibility in scanning mode and probe selection at the scope of whole operate spectrum.
- Through standard measurement and calculation, EICKEMEYER Magic 5000 digital can be applied in ultrasound diagnostic examination of abdomen, obstetric, gynecology, urology, cardiology and small parts etc. The system can provide complete clinic image under multiple imaging mode at real-time status.
- The system can have 2-probe connector, which can use convex, linear, micro-convex probe etc. Each probe is wide-band with 4-step multi-frequency, which allows it to fit to different body-sized patients.
- Multi-periphery devices are available, such as Video printer□USB and network equipment etc. Optional connector DICOM 3.0 can be used for transferring the image and long-distance diagnosis.
- It owns mature control panel design and reasonable systematic analysis. Even with strong functions, it has user-friendly interface and is easy to operate by using multi- functional knob and function selection button.
- Operation interface, annotation system and in-built report are all in English.
- It is a versatile portable ultrasound image system with excellent performance and compact structure. It has excellent appearance, back-lit silica gel keyboard and more user-friendly design, which is easy for user to do operation.

1.2 Main Function

1. Display mode: B, B/B, 4B□B/M, M. In the M or B/M mode, 4-step scan speed is provided for selection.
2. Multi-step display magnification, depth enhancement.and scrolling screen function.
3. Setting adjustment of total gain, brightness and contrast; Be provide with wideband frequency conversion; 6 segment of STC for selection and adjustment.
4. Strong image post-processing function, 8 kinds of IP parameters combination for selection.
5. Clear and stable image with high resolution by adopting techniques, such as multi-stage transmitting focusing, continuously dynamic receiving focusing, continuously variable aperture control, continuously dynamic frequency scanning,wide dynamic range and wide-band low noise

preamplifiers, logarithmic compression, STC control, dynamic filtering, edge enhancement, frame correlation, linear averaging, 256 gray scale image display etc.

6. Image freezing and storage function, the system can store 16 frames image at best. Through USB Port can connect to the outside remove memorizer, to carry out mass storage; stored images can be retrieved for analysis.
7. 128 frames of real-time image can be stored in Cine-memory.
8. Probe scanning direction can be changed and image left/right, up/down reversing;
9. Measurement and automatic calculation of distance, area, circumference, volume and fetal weight and automatic OB calculation function, direct display of fetal age and expected date of childbirth as well as direct measurement of heart rate;
10. Ellipse and trace methods provided for area measurement;
11. Display of more than 30 kinds of body marks together with corresponding probe position indication;
12. Biopsy function;
13. Annotation function in image area of the screen, special annotation terms for different exam-mode can be added according to user's need;
14. Patient ID No.,time and date according to real-time clock displayed in the screen;
15. Track ball available for operation and measurement. Characters can be inputed directly by keyboard;
16. When one function is under operating, the corresponding key on the keyboard will be brightly lit. When exiting from one function, the corresponding key on the keyboard will be slightly lit;
17. Standard PAL video frequency siginal and VGA siginal output.
18. Green products to protect ecological environment. when the trackball or any other key is not operated beyond a certain period (User-defined time), the system come into dormant status temporarily. Under that condition, pressing any key or turning the trackball, it can be recovered to the original operating state.

1.3 Technical specifications

1.3.1 Scanning mode:

Electronic convex scan
Electronic linear scan

1.3.2 Display mode:

B mode
B/B mode
4B mode
B/M mode
M mode

1.3.3 Probe connector: 2

1.3.4 Probe type:

Convex probe C20615S : main frequency 5.0MHz;
Linear probe L74615S: main frequency 5.0MHz.

1.4 Main features:

1.4.1 Acoustic power

16-level adjustable acoustic power

1.4.2 Transmission Focusing

16-step transmission focuses with maximum 4 focus points can be selected simultaneously.

1.4.3 B mode display

Two display status: real-time or frozen
Image vertical / horizontal reversing

1.4.4 Display depth:

Electronic convex□C20615S□:5-24cm□20 grades adjustable
Electronic linear □L74615S□:3-12cm□10 grades adjustable

1.4.5 M mode

Scan speed: 4 levels, 1cm/s□2cm/s□3cm/s□4cm/s

1.4.6 Preset exam-mode

Five type: abdomen, OB/GYN, cardiology, small parts, user-defined

1.4.7 Gray scale

256 levels gray scale display

1.4.8 Image processing

Pre-processing: dynamic range transformation, edge enhancement, smoothness, frame correlation, linear averaging;
Post-processing: gray scale rejection, gray scale transformation, γ correction;
8 kinds of IP parameters combination selectable

1.4.9 Gain adjustment

B, M mode separate total gain adjustment
6-segment STC adjustable

1.4.10 Cine-memory

128-frame Cine-memory, automatic / manual bi-directional playback

1.4.11 Measurement and calculation

1. B mode normal measurement:
Distance, circumference, area, volume, ratio, stenosis ratio, residual urine volume, angle, profile, histogram

2. M mode normal measurement:
Distance, time, velocity, heart rate

3. Obstetric calculation
Gestation age (GA), fetal weight and EDD (Estimated date of delivery) calculation
Fetal growth curve

4. Cardiac measurement:
Left ventricular function

1.4.12 Memory function

Screen file can be saved.
USB port available for easily copying files. Optional part DICOM 3.0 can be used to transfer images and files for long-distance diagnosis.

1.4.13 Video outlet

Video frequency siginal and VGA outlet.

1.4.14 Monitor

10-inch SVGA B/W monitor

1.4.15 Standard configuration

1.Main unit
2. C20615S 5.0MHz convex wide-band frequency conversion probe

Table 1-1 Probe type

Probe Type	Frequency	Application
C20615S	3.5/5.0/6.0/7.0 MHz	Abdomen,OB/GYN
L74615S	3.5/5.0/6.0/7.0 MHz	Small parts, GYN

3. Relative accessories

Table 1-2 Optional accessories

Part Name	Model	Application
Video printer	SONY or Mitsubishi video printer	Print video image
Image and text printer		Print exam-mode report
Trolley	Special designed by EICKEMEYER	Carry 8300 and its accessories

1.5 Operating conditions

1.5.1 Environmental conditions:

- Ambient temperature□ 5□40□
- Relative humidity□ 30%□80%RH
- Atmospheric pressure□ 86□106Kpa

1.5.2 Power requirement:

220 V AC±22V, 50Hz±1Hz, The power plug should be inserted into a fixed power socket with protective grounding. Any connector or plugboard (eg. three phase-two phase plugboard) is not allowed to use.

Note: The system should be placed in a well-ventilated and dry place and kept away from strong electromagnetic interference, poisonous and corrosive gas. Direct sunlight and raining should be avoided.

Chapter 2 Safety Precautions

2.1 Safety classification

2.1.1 According to the type of protection against electric shock: CLASS I EQUIPMENT

CLASS□EQUIPMENT means that it can not only have the basic insulation function, but also be grounded for protection against electric shock. Show as the left symbol.

2.1.2 According to the degree of protection against electric shock: TYPE-BF EQUIPMENT

TYPE-BF EQUIPMENT means that it is the TYPE B equipment with Type F applied parts (connecting different kinds of hanging probe). Show as the left symbol.

2.1.3 According to the degree of protection against ingress of harmful water:

General type of equipment

2.1.4 According to the degree of safety of application in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR (or WITH OXYGEN or WITH NITROUS OXIDE):

Equipment not suitable for use in the environment of **FLAMMABLE ANAESTHETIC MIXTURE WITH AIR (or WITH OXYGEN or WITH NITROUS OXIDE)**

2.1.5 According to the mode of operation: Continuous operation device

2.2 Safety

To ensure the safety of patient and operator, please read the following safety notes before operating the system.

1. Please do not put the probe on one same part of the patient for long time, especially the fetus that is growing bones and histiocyte, so that to avoid unnecessary radiation to human body.

2. The system should be operated by qualified operator or under the qualified operator's instructions. Patient is not allowed to touch the system.
3. Choose the power cord acknowledged by the manufacture. The system should be plugged into a fixed power socket with protective grounding.
4. When use power plug, any connector or plugboard (e.g. three phase-two phase plugboard) is not allowed to use.
5. Any device not acknowledged by the manufacture is not allowed to use, which includes the probes and accessories not provided by the manufacturer.
6. Never open the plastic case or panel when the system is power on. If need to open it, the qualified operator is only allowed to do operation after the system is power off.

Maintenance and Examination : Along with use temporal postpone, due to distortion and abrasion of machine parts, it would cause reduction of electric security or machine security, due to reduction of sensitivity and differentiate, image quality would become worse. For ensure system operating capability in gear, advice to formulae maintenance and examination plan, to prevent occur of suddenness and misdiagnosis.

2.3 Requirement for environment

2.3.1 Working environment

- **The ultrasound system should be operated, preserved and transported under the following conditions:**

Conditions / Parameter	Operation	Preservation	Transportation
Temperature	5□ 40□	-5□ 40□	-30□ 55□
Humidity	30% 80%□ no condensation	Less than 80%□ no condensation	Less than 95%□ no condensation
Atmospheric pressure	86kPa 106kPa	86kPa 106kPa	50kPa 106kPa

Caution When moved into a room from outside after transportation, the ultrasound system might be still too cold or too warm comparing to the indoor temperature. Because of the temperature difference, water may condense inside the machine. So before turning on the power, the system should be put inside the room for a while to adapt to the environment.

If the outside temperature is below 10□ or above 40□, the system need to be put for half an hour for adapting before operation. And the adapting time need to be prolonged for 1 hour for each additional temperature difference of 2.5□.

2.4 Attentions for operation

1. The ultrasound system should be used far away from with strong electromagnetic field nearby (e.g. transformer). Otherwise, the system will be affected.
2. The ultrasound system should be used far away from high-frequency radioactive device nearby (e.g. mobile phone). Otherwise, the system will get damaged or be affected.
3. To avoid the damage on the system, please don't operate the system under the following environment:

   ·Environment with direct sunshine

   ·Environment with sharp temperature change

   ·Environment with full of dust

   ·Environment with strong impact or shaking

   ·Environment near to heating system

   ·Environment with high humidity
4. Please wait at least 1 minute to restart the system after it is turned off. If not, it may result in a malfunction in the system.
5. After using the probe, you may use tampon dipped by clean water to clear ultrasound gel remaining on the probe and then put the probe into the probe holder. Please keep the probe clean and dry.
6. The probe must be connected or disconnected only when the system is powered off. If not, it may result in a malfunction in the system.
7. Operator may record registration information (including hospital and patient information etc). To ensure data safety, please do external copy regularly as data stored in the system may get lost due to misoperation.
8. Please read all the attentions for operation of this manual carefully.
9. If operate the system in a room with small space, the room temperate may rise, please keep the room well ventilated.
10. The fuse inside the system may be replaced, and only the service people or technician acknowledged by manufacturer is allowed to do the replacement.

2.5 Symbol and meaning

The meaning of mark and symbol used by the system and manual is listed as blow:

Caution	To avoid any damage on the system, ensure the normal and effective running of the system, and avoid any damnification on the person, the following precautions should be observed strictly.
	Type BF applied part
	Protective earth (ground)
	Earth (ground)
	Equipotentiality
	Main unit power off
	Main unit power on
	Brightness of monitor
	Contrast of monitor

Chapter 3 Introducing System

Outlook

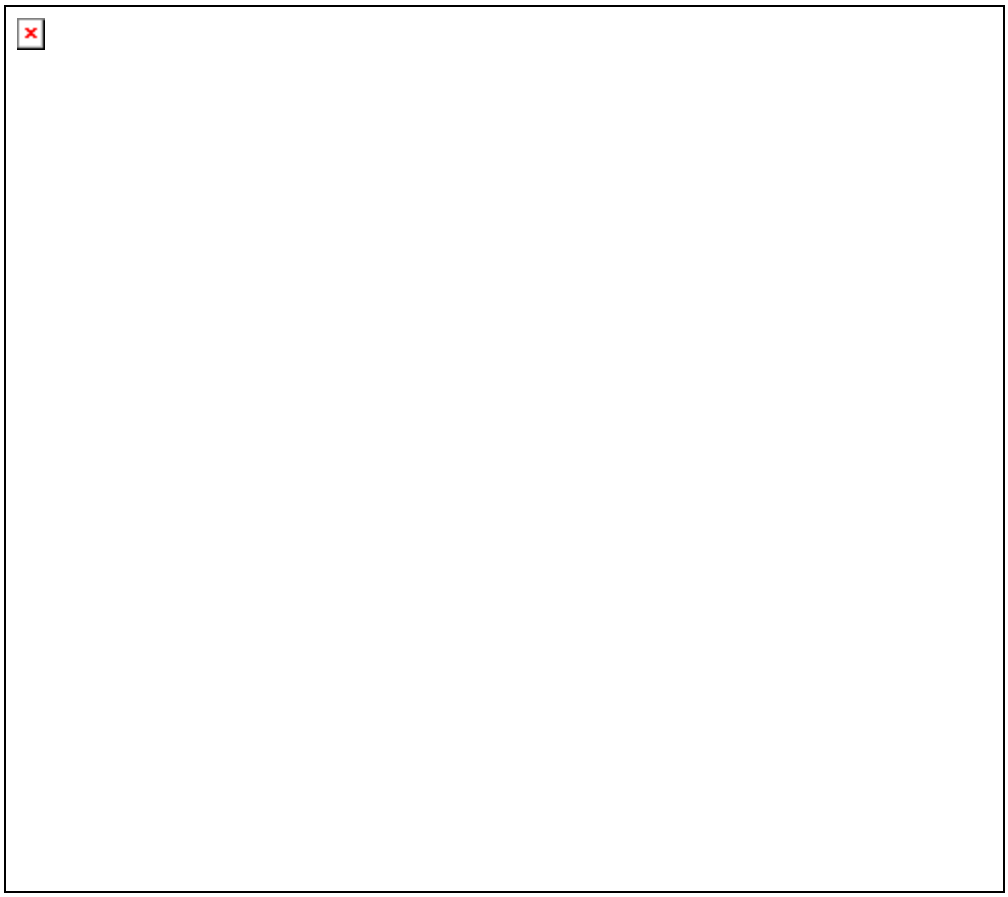


Fig.3-1 The outlook of the system

3.2 Main unit overall dimensions:

420mm□Length□×300mm□Width□×350mm□Height□

3.3 Name of each part

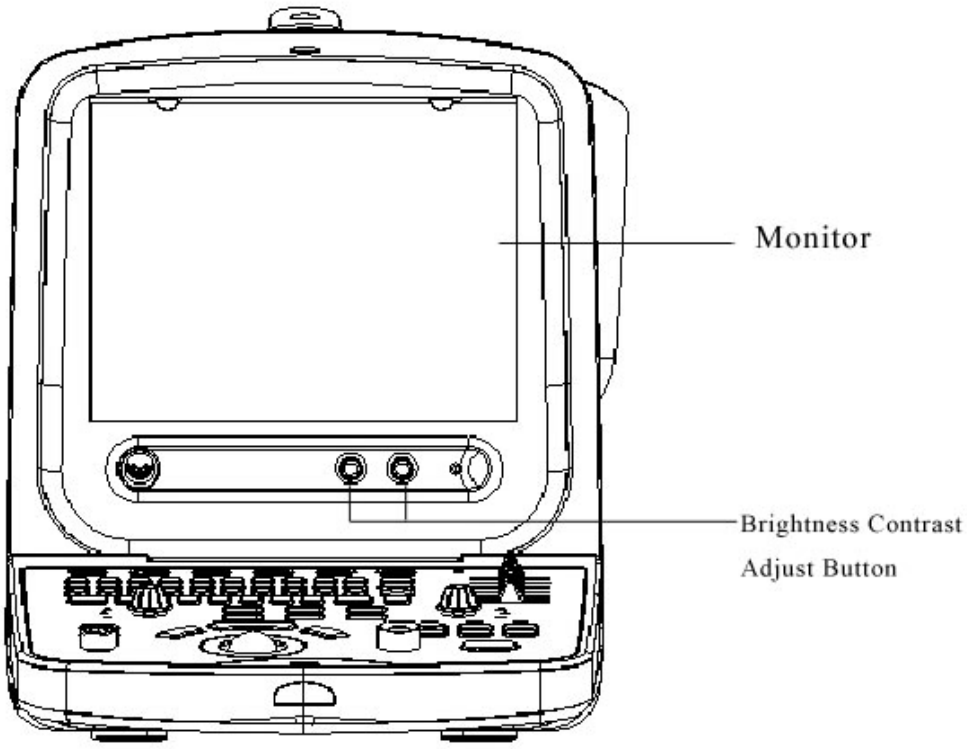


Fig 3-2 Elevation of the system

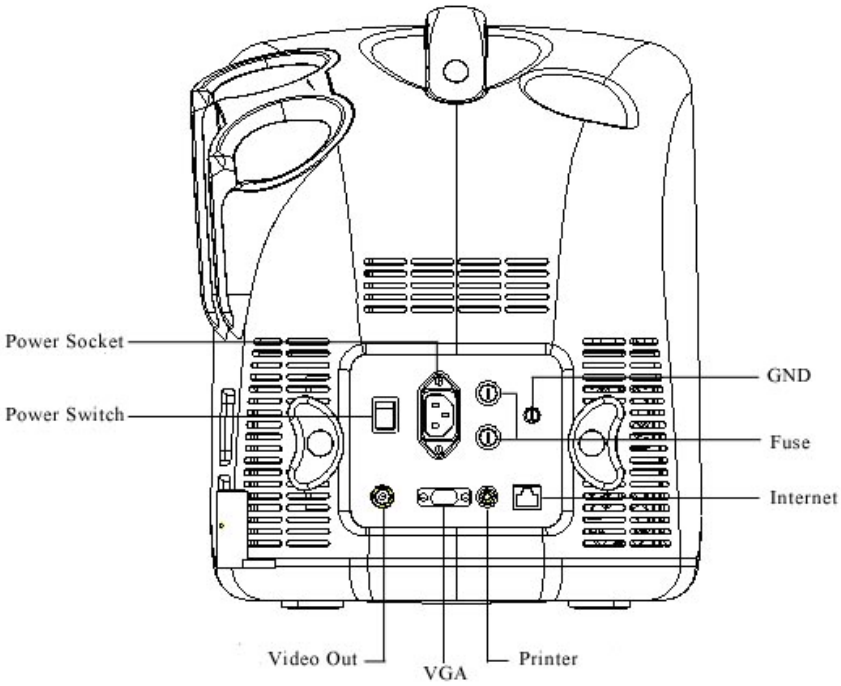


Fig 3-3 Rear elevation

3.4 Control Panel

Show the control panel as follows:

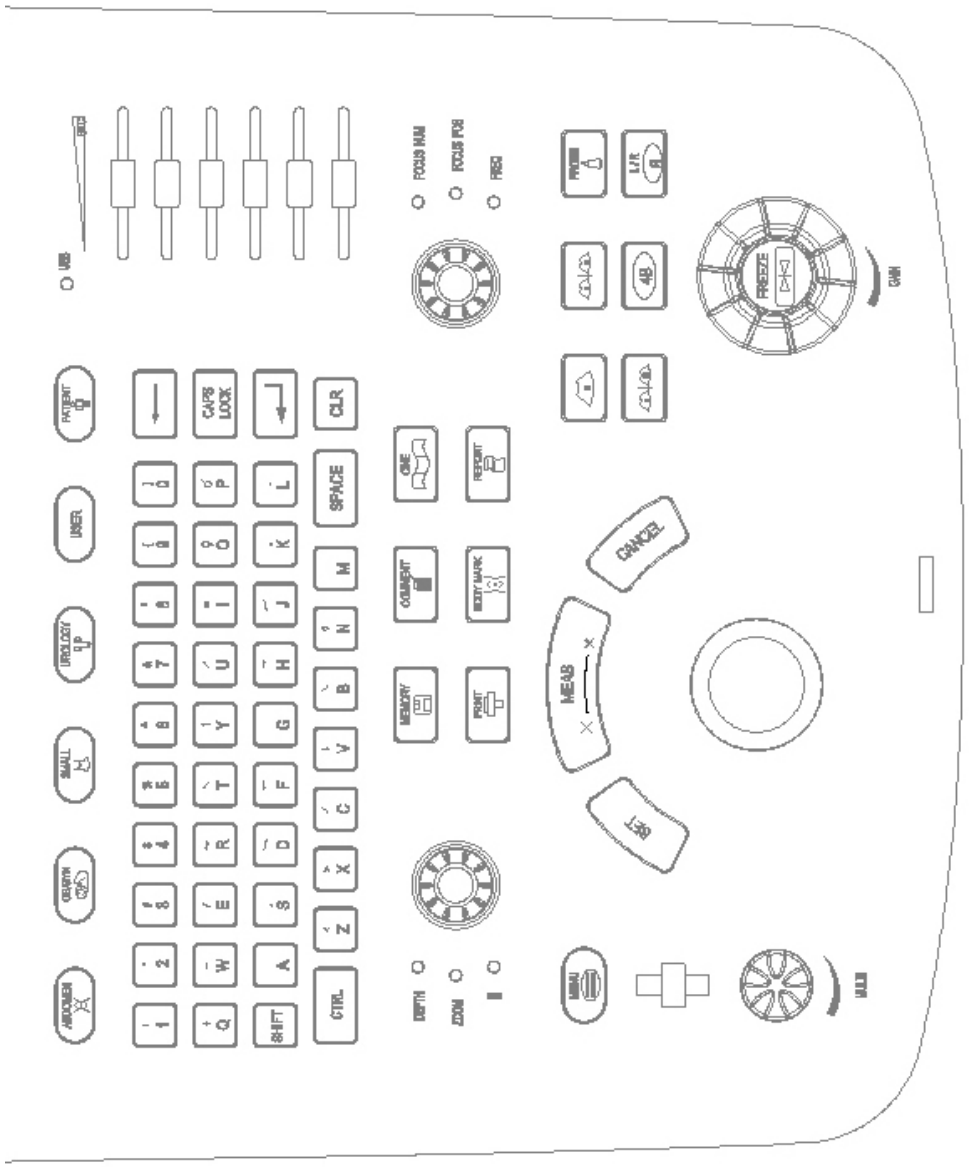


Fig 3-4 Control panel

3.5 The way of installation

Note: Do not turn on the power switch before finishing all the installation and preparation.

3.5.1 Environment Condition

The system should be operated under the following environments.

3.5.1.1 Working environment

Ambient temperature□5~40□
Relative humidity□Less than 80□
Atmospheric pressure□700□1060 hPa

3.5.1.2 Working space

Please keep at least 20cm spare space from the left side and back of the system.

Note Please keep enough space away from the left side and back of the system to ensure well ventilation. Otherwise with the increasing of the temperature inside the unit, malfunction may be caused easily.

3.5.2 Connecting the electric power

After making sure that the AC power in hospital is in normal state, connect one terminal of the power cord to the AC 220V 1A IN socket (or 110V AC ±10%, 60Hz ±1Hz, grounded when the customer ordered for 110V AC ±10% input machine) at the rear panel of the system, and connect the other terminal to the AC power socket in hospital.

3.5.2.1 Grounded protecting terminal

The AC power plug of the system is three-pin grounded plug. The grounded protecting terminal inside is connecting to the grounded protecting system of the power supply.

Please make sure that grounded protecting system of the power supply works normally.

Caution Do not connect three-pin grounded plug of the system to two-pin socket which is not grounded, otherwise that will cause the electric shock.

3.5.2.2 Equipotentiality terminal

is the symbol of the equipotentiality, used as the grounded protecting equipotentiality between the equipment and the other electronic equipment.

Caution: When connecting another electric equipment to this system, please connect to each equipotentiality terminal with the equipotentiality cable, otherwise that will cause the electric shock. The ultrasound system must use the power cord provided by the manufacturer, and the power cord cannot be replaced freely. Meanwhile reliable grounded protection must be assured.

Connecting/disconnecting the probe

Caution Please use the probes provided by manufacturer only! Otherwise it may cause the damage to the system and the probe.

3.5.3 Install probe

Warning Before connecting the probe, please carefully check the probe, cable and connectors and make sure that whether there is anything abnormal, such as cracks, shelling off. Once use any abnormal probe, there is possibility of electricity shock.

1.Switch on the probe connector locked switch, vertically insert linker socket.

2.Along clockwise turn probe connector locked switch for 90°.

3.Check the probe socket whether or not locked.

Warning: Only power supply at “turn off” or “freeze” state, can install / take-down the probe, otherwise it would be likely to go wrong. When install / take-down, should lay the probe within the corresponding the wire hanger of the probe, and the probe cable is hanging on the wire hanger, it can prevent the probe falling down to the ground.

3.5.3.2 Take-down probe

Along anti-clockwise turn the probe connector locked switch for 90°, vertically take off plug of the probe connector.

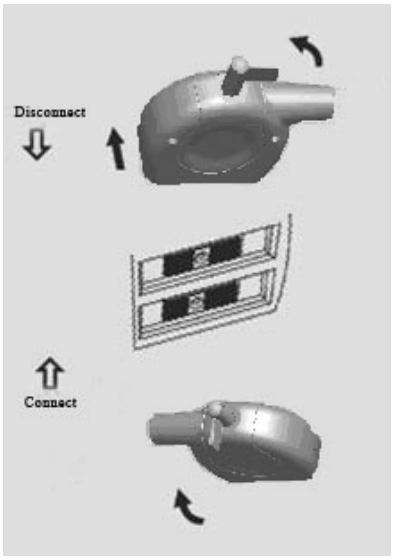


Fig. 3-5 Installing the Probe

3.5.4 Installing optional parts

Caution：Please use optional parts provided by manufacturer only! Otherwise it may cause the damage to the system and the equipment.

3.5.4.1 Installing Video Printer

7. Put the video printer steadily beside the main unit.

8. Connect one terminal of the video cable to the VIDEO IN socket at the rear panel of the video printer, and connect the other terminal of the video cable to the VIDEO OUT socket at the rear panel of the system.

9. Connect one terminal of the printer control cord to the printing control terminal at the rear panel of the video printer, and connect the other terminal of the printer control cord to the printing control terminal at the rear

panel of the system.

10. Connect the power cord of the video printer to the power socket.

11. Adjust the parameters on the back of the video printer according to the selected type of print paper.

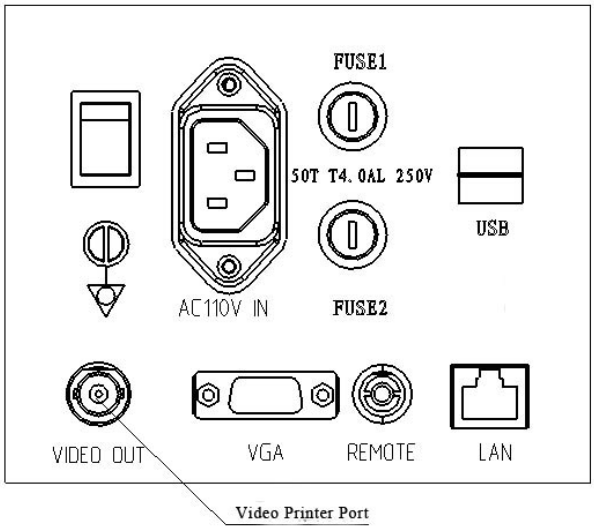


Fig. 3-6 Connecting the Video printer

Warning It is strictly prohibited to use any power cable other than the ones provided by the manufacture. Otherwise there is possibility of electricity shock.

The meaning of symbol on video printer

□video signal input

□video signal output

□printing control terminal

□power switch of video printer

3.5.4.2 Installing PC printer

1.Put the video printer steadily beside the main unit.,connect data cable of the printer to the USB port at the left side of main unit.

2. Connect the power cord of the video printer to the power socket.

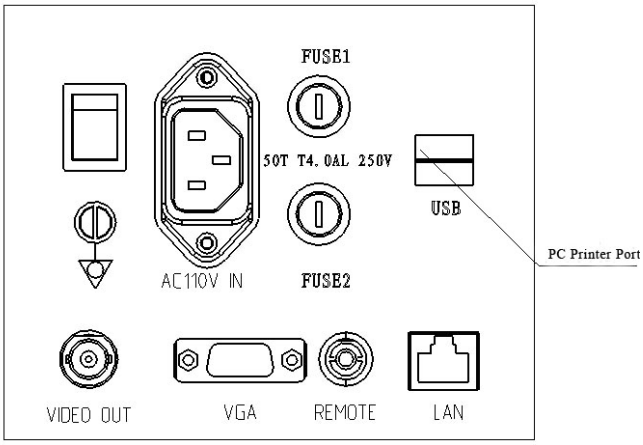


Fig.3-7 Connecting the PC Printer

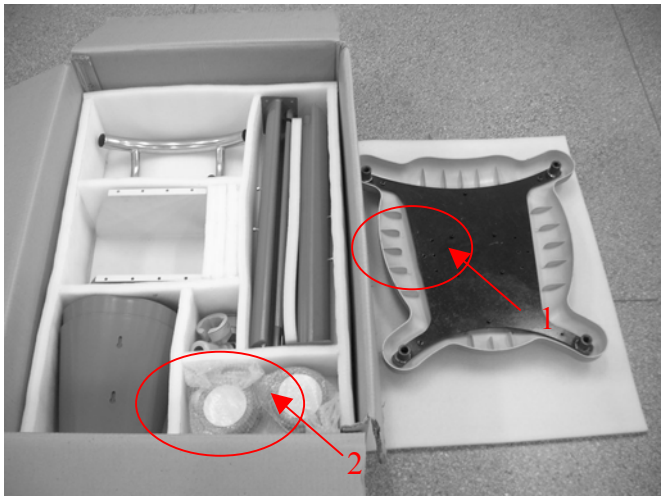
Warning: For basic configuration parts, please see the list of encasement. For installing trolley, please see the Appendix 1.

Appendix 1: Installation of TR-8000 Trolley

1. Open the packing.

2 Fix the wheel.

No.	Tools Name	Description	Quantity
1	Spanner(Diameter:24)	Bottom Board	1
2		Wheel	4



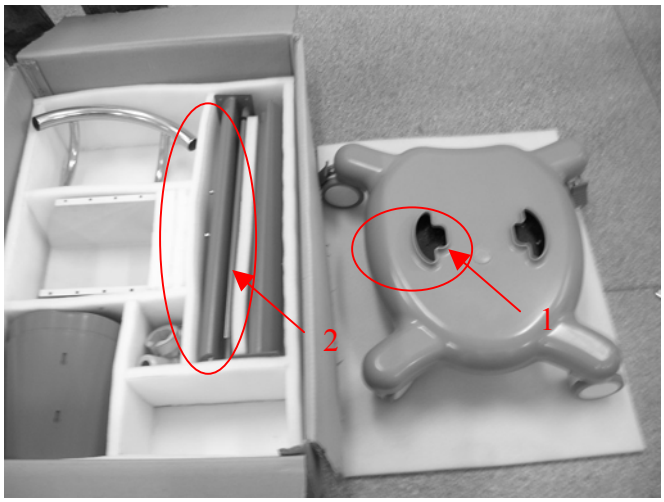
Note: It can lock the brake of wheels.

Note: Use spanner to turn.

Note:
1 The serial order of the wheel: the upper two wheels with brake, the under two wheels without brakes.
2 All wheels need turn completely, to make sure the underside parallel with the ground level.

3 Installation of the support

No.	Tools Name	Description	Quantity
1		Accessory of the bottom board	1
2		Support	2
3		Nut M5	8



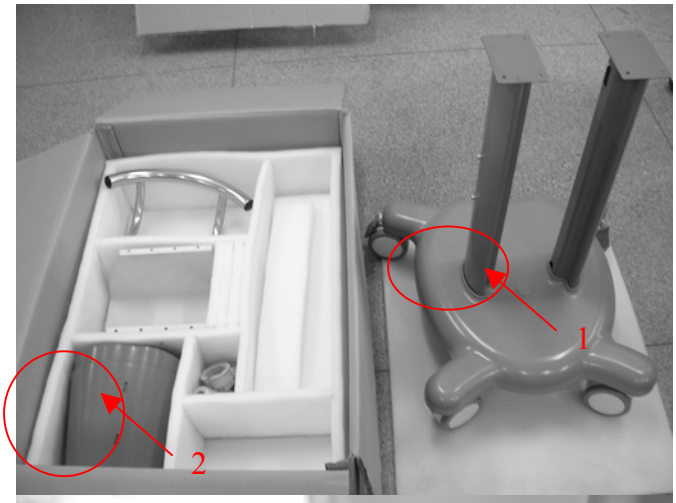
Note: The place which the support inserting on the picture.

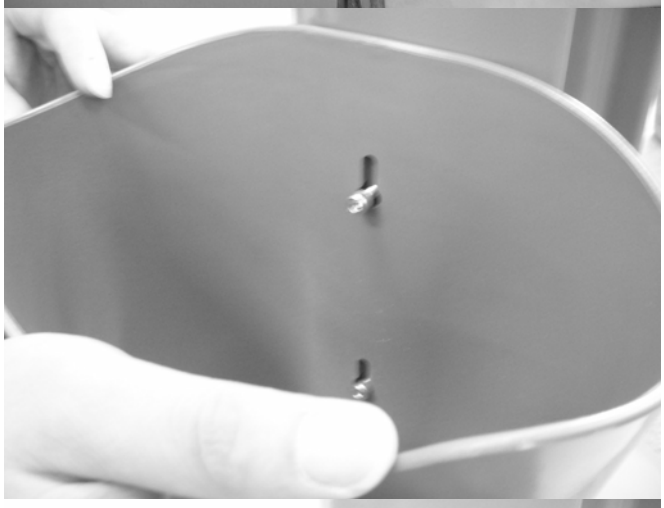
Note: Screw on and fix the M5 nuts. Do not fix it too tightly.

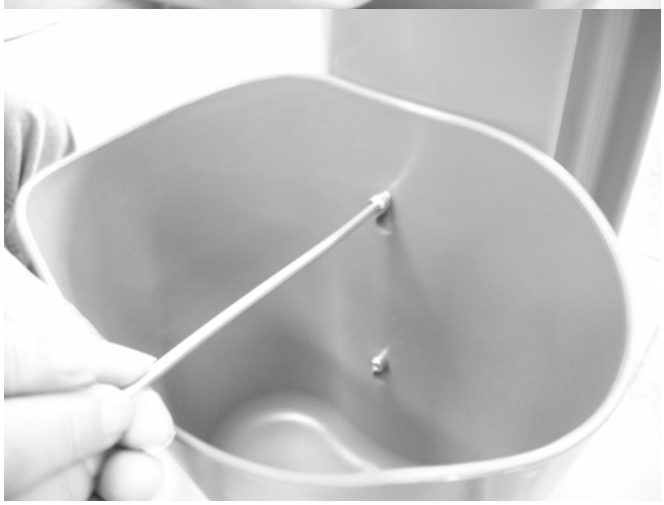
Note: The hatch direction of the support should be the same with the picture.

4 Installation of the data box

No.	Tools Name	Description	Quantity
1	M4 inner-hexangular spanner	Accessory of the bottom board	1
2		Data box	2



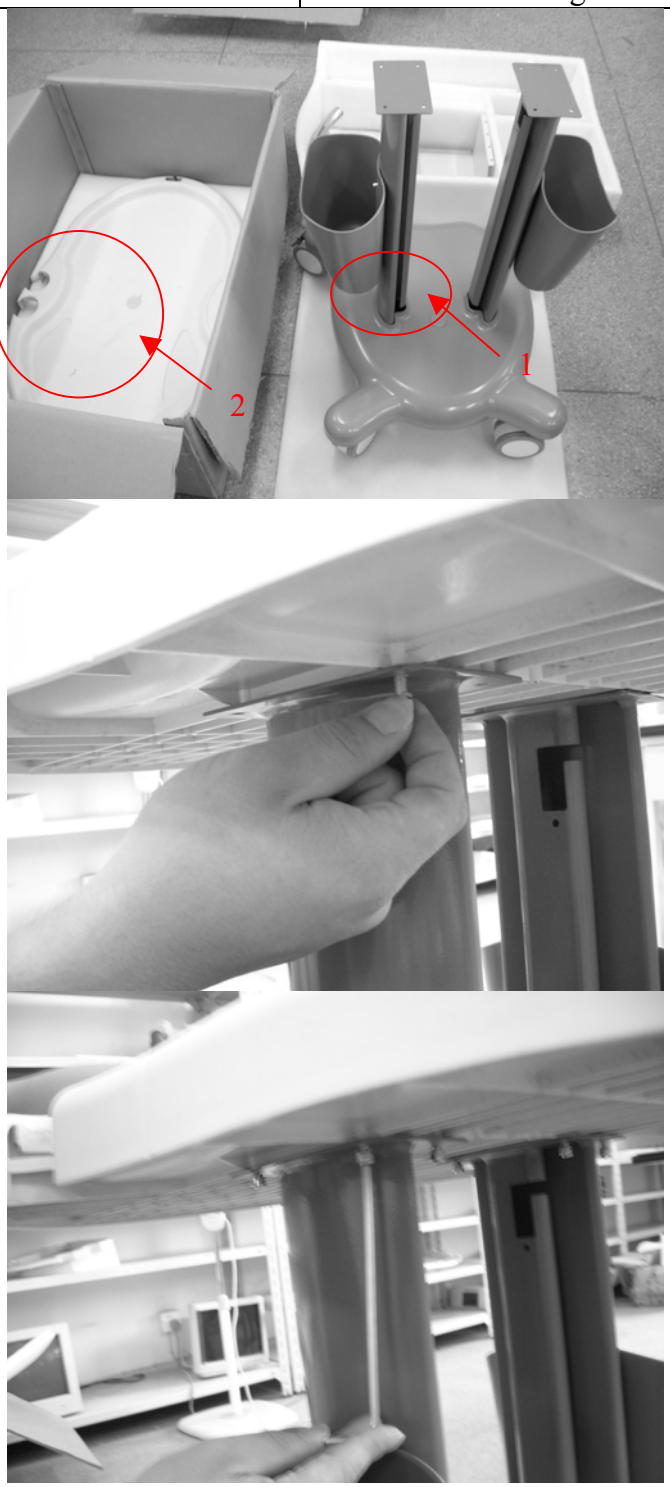




Note: Use inner-hexangular spanner to screw the upper nuts on the both sides of data box.

5. Fix the cover

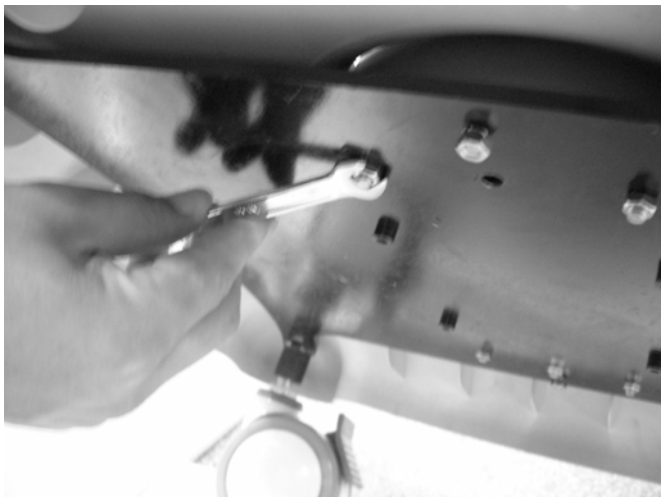
No.	Tools Names	Description	Quantity
1	M4 inner-hexangular spanner	Accessory of bottom board	1
2		Cover	1
3		M5×18 inner-hexangular bolts	8



Note: Use inner-hexangular spanner to screw eight bolts tightly which fix the cover .

6. Fix the bottom board

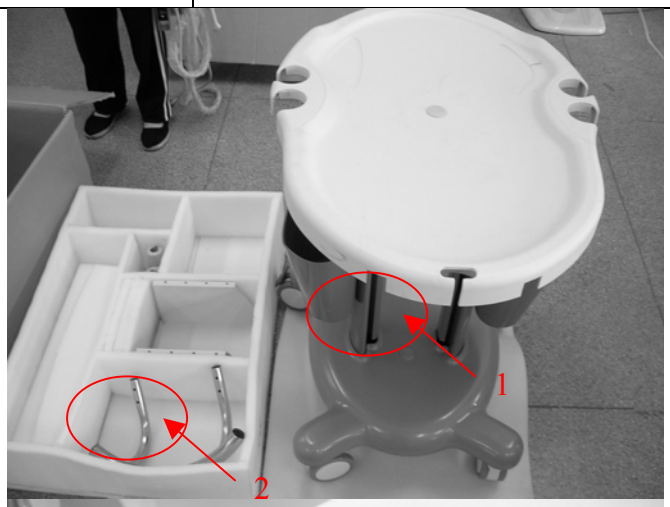
No.	Tools Name	Description	Quantity
1	M5 spanner	Accessory of bottom board	1



Note: Use M5 spanner to screw the eight nuts which used to fix the support on the bottom board.

7. Fix the handle

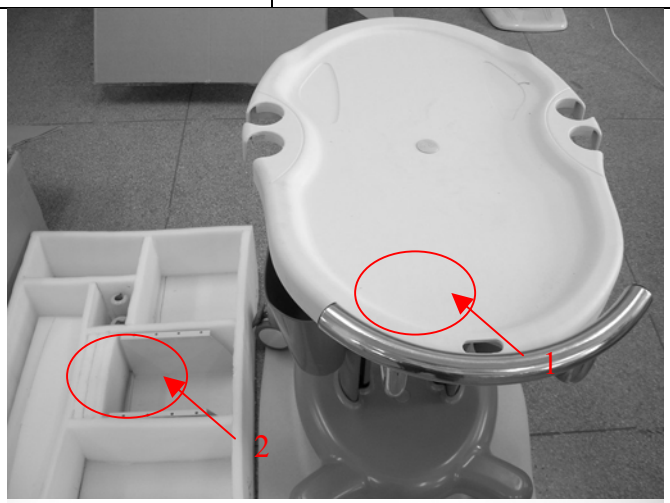
No.	Tools Name	Description	Quantity
1	M4 inner-hexangular spanner	Accessory of bottom board and cover	1
2		Handle	1
3		M5×30 inner-hexangular bolts	4



Note: Use M4 spanner to screw on the four bolts which used to fix handle.

8. Fix the printer box

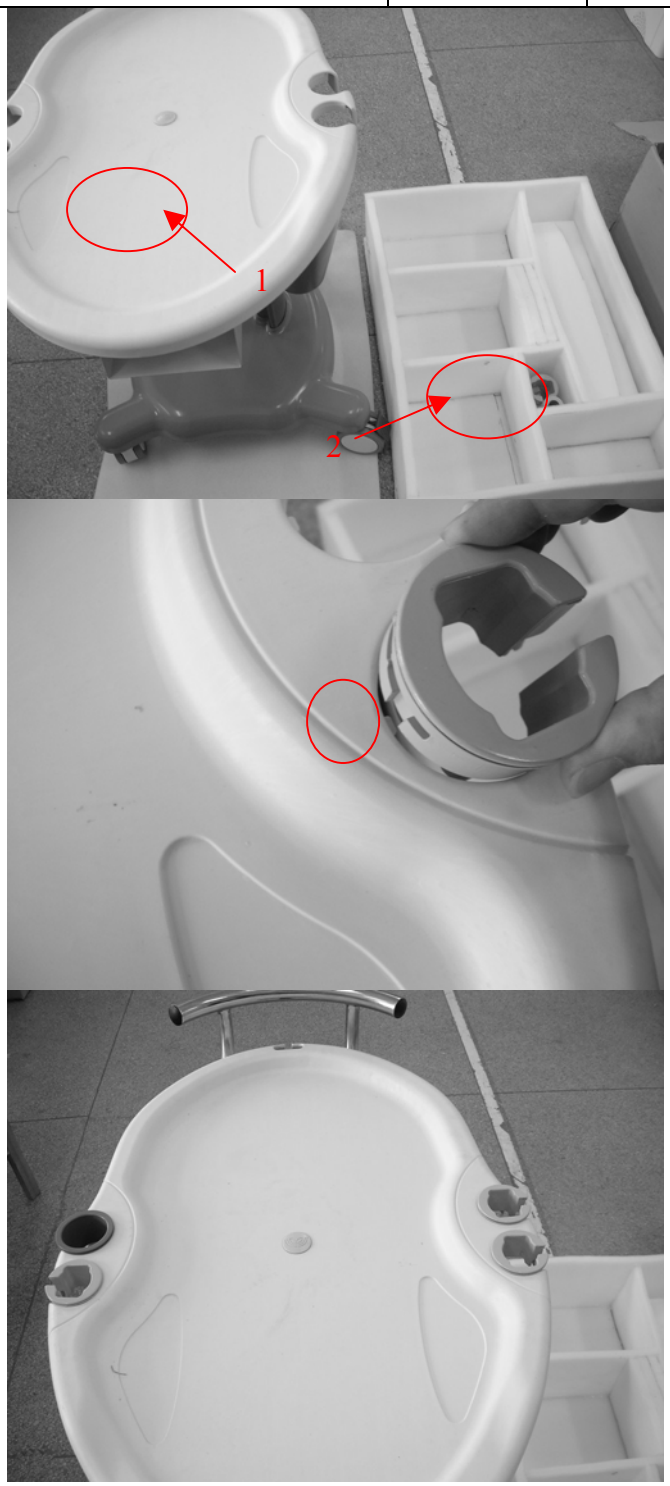
NO	Tools Name	Description	Quantity
1	M4 inner-hexangular spanner	Accessory of bottom board and cover	1
2		Printer box	1
3		M5×14 inner-hexangular bolts	8



Note: Use inner-hexangular Spanner to screw on the four bolts which used to fix the printer box.

9. Installation of the probe box

No.	Description	Tools Name	Quantity
1	Accessory of bottom board and cover		1
2	Probe box		4
3			



Note: There is need to take the slot of probe box at the fixed point when install the probe box. It can turn the probe box depends on the requirement after installation..

Chapter 4 Control panel

4.1 Outlook of control panel

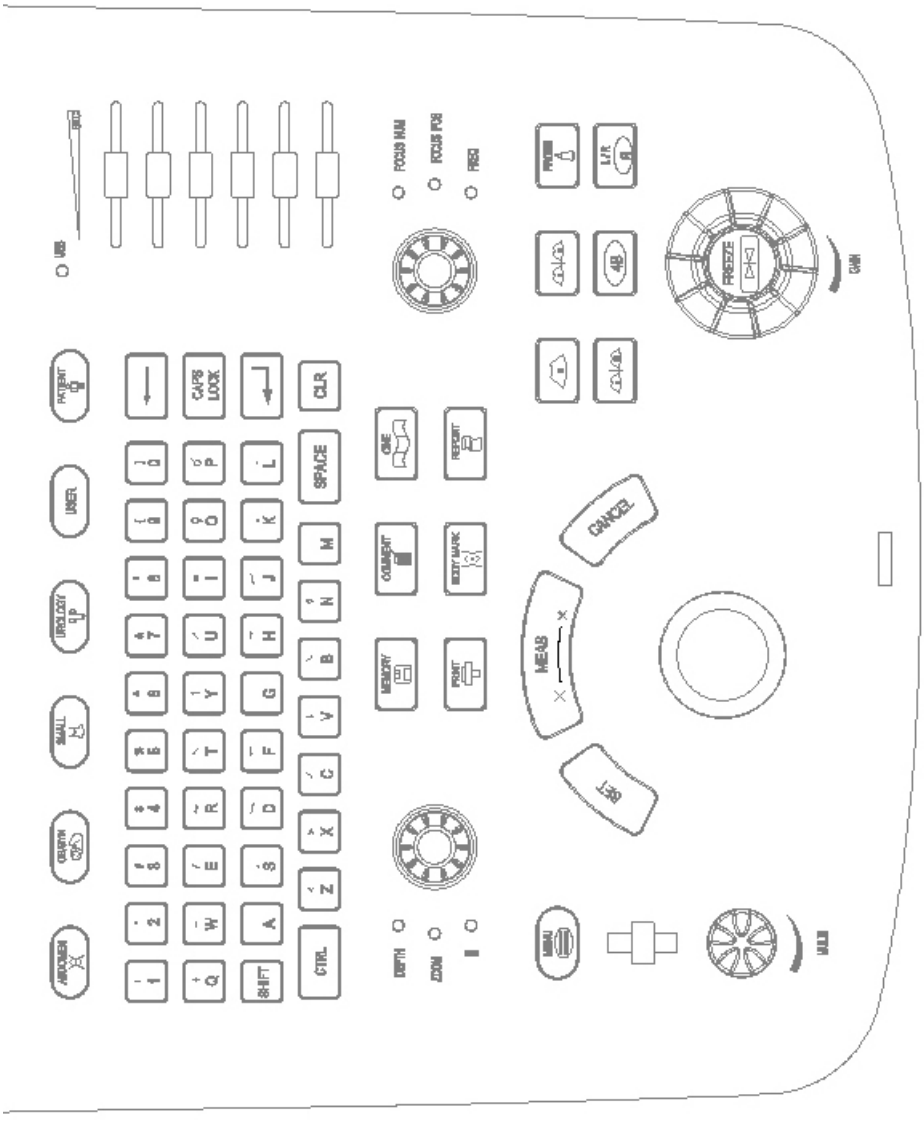


Fig 4-1 Control panel

The function of each key listed as below:

4.2 Character keyboard

Fig. 4-2 Character keyboard

The character key is used for inputting the patient ID, patient name, character and number. The direction key can also be used to move the cursor as the trackball.

4.3 Special function keys/knob

4.3.1 PATIENT

Set up a new patient data, and can inputting the patient ID, patient name and other information.

4.3.2 MEMORY

Save image, save patient information, and can recall the stored patient information.

4.3.3 MULTI

Multi-function knob, with other function cooperate to use, e.g. adjusting acoustic power, frame correlation etc.

4.4 Examination mode key

The examination programme of abdominal, OB/GYN, small parts, cardiac and the user defined
are provided according to the clinic diagnostic need. The parameters and conditions of each
examination programme have been preset in the system.

4.4.1 ABDOMEN

Abdominal examination mode

4.4.2 OB/GYN

OB/GYN examination mode

4 4 3 SMALL

Small parts exam mode.

4.4.4 UROLOGY

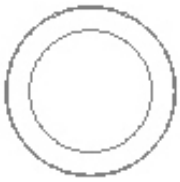
Urology exam mode.

4.4.5 USER

User – defined exam mode

4.5 Track ball and select/input key

4.5.1 Track ball



Trackball is the main operation tool on the screen interface, used for the selection and orientation. Normally the trackball control the position of cursor. Trackball used with other keys, when system deal with different operation state, the function of trackball is different as well.

4.5.2 SET

SET key is a multi-function key and used with the trackball. Its function changes with the working state, such as fixing the cursor position, body mark position, comment position or select the menu, confirm inputting etc.

4.5.3 CANCEL

CANCEL key is a multi-function key and used with the track ball. Its function changes with the working state, such as recalling annotation database.

4.6 Image mode key

4.6.1 B

- Display signal B mode

4.6.2 B/B

- Display two single B mode image at the same time.

4.6.3 B/M

Display B Mode image and M mode image at the same time.

4.6.4 4B

Display 4 frames images juxtaposition.

4.7 Image control key

4.7.1 CINE

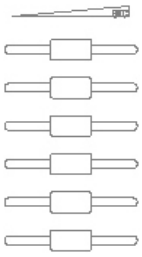
- Start cine-loop function manually.

4.7.2 L/R

Left/right reversing of B-mode image.

4.8 Image adjustment keys

4.8.1 STC


Adjust depth gain compensation

4.8.2 GAIN

Adjust image gain in B mode or M mode.

4.8.3 FOCUS NUM/FOCUS POS/FREQ

□FOCUS NUM□used to adjust the focus number from 1 to 4 when it is lit;
□FOCUS POS□ used to adjust the focus position;
□FREQ□ used to adjust the probe frequency.

4.8.4 DEPTH/ZOOM/IP

□DEPTH□ used to adjust scanning depth when it is lit
□ZOOM□ used to adjust zooming step of the image when it is lit
□IP□ used to adjust gray scale transformation of the image when it is lit

4.9 Operation mode key

4.9.1 MEAS

Press this key to enter the measuring status

4.9.2 COMMENT

- Press this key to enter commenting status, and add comments in the image area on the screen.

4.9.3 BODYMARK

Press this key to enter Body mark working status, and select the body mark and the probe scanning position on the screen.

4.10 Probe control key

4.10.1 PROBE

Probe select key-select probe

4.10.2 FREQ

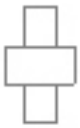
See 4.8.3 FOCUS NUM/FOCUS POS/FREQ selection knob
Its function is to change the transmitting frequency of the probe

4.11 Other function keys

4.11.1 MENU

Display or hide the menu bar

4.11.2 **Toggle-switch key**



Used to up-down selection of each menu item.

4.11.3 CLR

Cls key, used to clear measurement staff guage, body mark and annotation character.

4.11.4 Print key

Use video frequency printer to print out the image on the screen.

Chapter 5 Main Interface

This chapter describing display mode of the image, and particular introducing the image interface.

Select display mode

There is five image display mode: B, B/B, 4B, M, B/M, and different mode can be shifted by press mode shift key.

Fig 5-1 Mode shift key

Single B mode

Press [B]mode shift key to display single B mode image. B mode is the basic operating mode for two-dimensional scanning and diagnosis. For example: the explain for the single B image interface, see below figure:

Fig 5-2 Display of B mode

B/B mode

Press [2B] mode shift key to display double B mode images side by side. One image is in real-time state; the other is in frozen state. The real-time image is marked by"▼". Press [2B] mode shift key in 2B mode, the original active image is frozen and the original frozen image is activated.

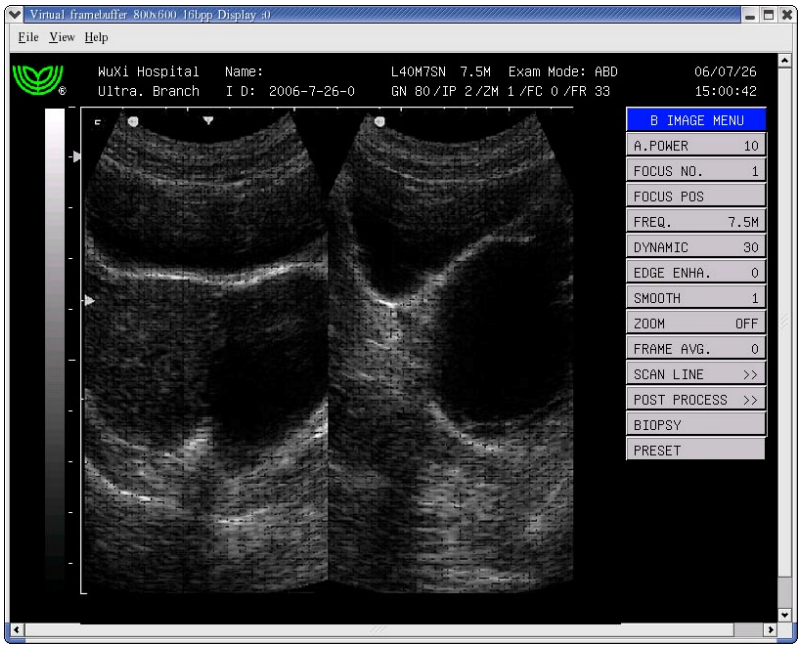


Fig 5-3 B/B mode

4B mode

Press □4B□key, four frames B images will be side by side displayed on the screen, but only one image is activity, press □4B□key can switch among four images.

Fig. 5-4 4B mode

B/M mode

Press [B/M] mode shift key to display both real time B-mode image and M-mode image simultaneously. And a dotted line-sampling line will appear in the B-mode image area; indicate the line-sampling position of M image on the B image area, change the position of line-sampling by move trackball.

Press [B/M] key again, B image mode will be frozen, M image mode is still active.

Press [FREEZE] key to freeze both B mode image and M mode image.

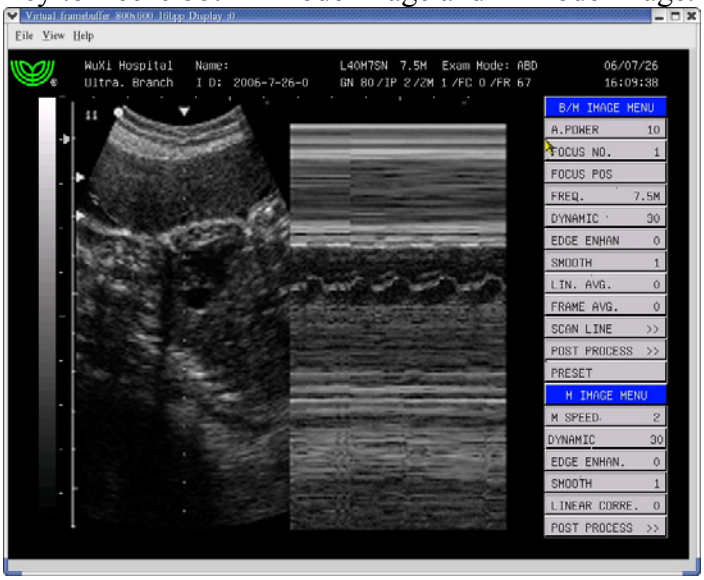


Fig 5-5 B/M mode

Note: Before confirming the position of sampling line, the cursor cannot be moved out of B image area.

M mode

After B/M image is displayed, press □B/M□key, and it will be display single M mode image. M mode image reflects movement of tissues at the points on the sampling line. The M mode image display varies with time, so it is especially suitable for cardiac examination.

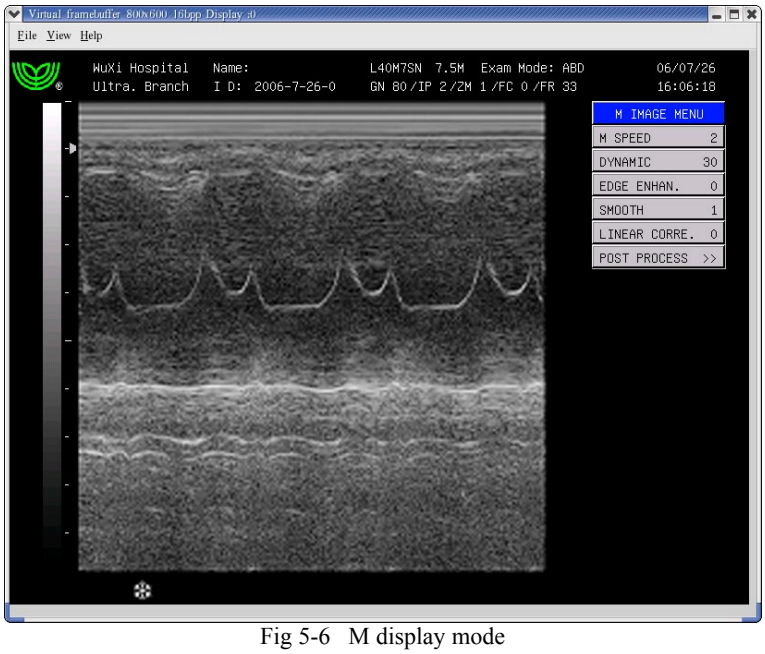


Fig 5-6 M display mode

Image interface display

Take B mode as an example:

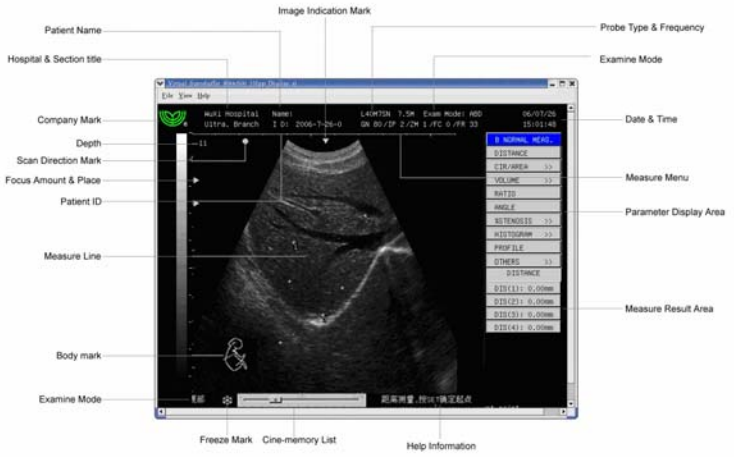


Fig 5-7 Image interface display

Chapter 6 Image control and adjustment

This chapter describes the operation about image control and adjustment, including adjustment of image parameters, partial zooming and image reversing etc.

Adjustment by control panel

Users can do the adjustment of image parameters with combination of knob on the control panel and the menu bar. Most of the numerical value of parameters adjusted by control panel, display in parameter display area at the upper part of the screen.

Total gain

At the real-time status, turn [GAIN] knob to adjust the gain value of B mode image or M mode image respectively from 0 to 99 dB, the least adjustment unit is 1. B and M Gain value displays in the parameter display area at the upper part of the screen.

Fig 6-1 Gain knob

Caution: Gain value cannot be adjusted in image frozen status!

STC

STC curves can be used for adjusting different depth gain compensation. The corresponding STC curve changes with the STC slide block in the right upper of the control panel. During adjustment, the STC curve will appear automatically in the left of the screen, and changes with the moving of the STC slide block. Show as follows: STC curve will disappear automatically after stopping adjustment for 1 second.

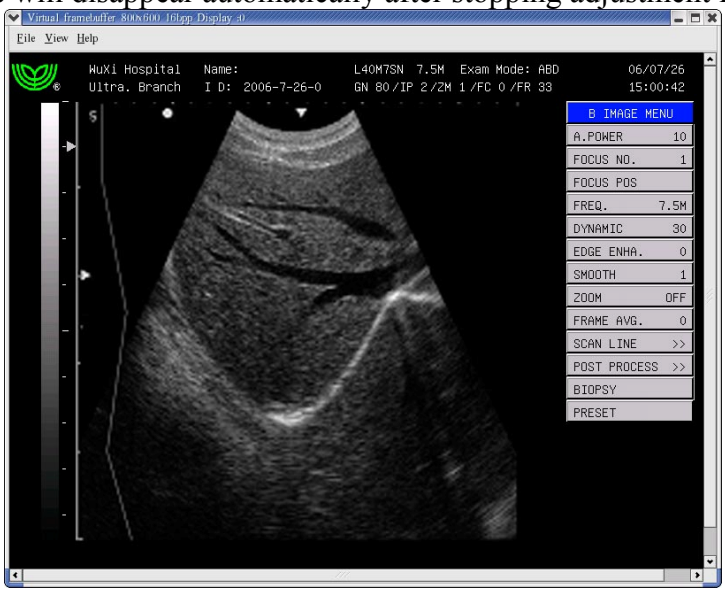


Fig 6-2 Adjust STC curves

Caution: At frozen status, adjusting STC will be in abeyance, after unfreeze, it will become effective.

Depth of image

Press the **[DEPTH/ZOOM/IP]** selection knob□select **[DEPTH]**□then the indicator of **[DEPTH]** will be lit, turn the knob to change the depth of image.

Fig 6-3 DEPTH/ZOOM/IP selection knob

Caution: The depth can not be adjusted when the image is frozen.

Zoom function

Press the **[DEPTH/ZOOM/IP]** selection knob□select **[ZOOM]**□then the indicator of **[ZOOM]** will be lit□turn the knob to change image zooming steps and the zooming parameter displays in the parameter display area. There are 4 kinds of zooming mode: 1 to 4.

Caution: The image zooming can not be adjusted when the image is frozen.

Image reversing

B mode image can be reversed horizontally.
Press the **[L/R]** the displayed image is turned over in the right-left direction.

The meaning of the symbol indicating the status of the horizontal reversing in the upper left of the screen is like that:
"⎔" situated in the left indicates that the first scanning line in the left is corresponding to the original scanning position of the probe, "⎔" situated in the right indicates that the first scanning line in the right is corresponding to the original scanning position of the probe.

Fig 6-4 horizontal reversing key

IP

IP is the combination of a group of image processing parameters (dynamic range, edge enhancement, smoothness, dynamic filtering, frame correlation, linear averaging), which represents the image processing effect.

The value range of IP is 1~8, represents the effect of 8 kinds of image processing respectively. The smaller IP value is, the greater the contrast of image is. The greater IP value is, the softer the image is.

Caution IP value is only available for B mode image, and in frozen status, IP value cannot be changed.

Press the **[DEPTH/ZOOM/IP]** selection knob select **[IP]** then the indicator of **[IP]** will be lit Turn the knob to change IP .

Image Menu adjustment

Acoustic power

Acoustic power means the ultrasonic power emanated from the probe.
At the real-time status, move the track ball to the **[Acoustic power]** the menu item gets bright. Turn **[MULTI]** clockwise the value will get larger. If trurn **[MULTI] anti**clockwise, the value will get smaller. The current acoustic power displays directly in the right upper of the menu. The adjustment range of Acoustic power is 0 to 11, and its adjustment unit is 1/step.

B IMAGE MENU
A. POWER
FOCUS NO.
FOCUS POS
FREQ.

DYNAMIC
EDAGE ENHAN
SMOOTH
ZOOM
FRAME AVG.
SCAN LINE
POST PROCESS
BIOPSY
PRESET

Fig 6-5 Acoustic adjustment

tion The adjustment of the acoustic power is not available in the frozen state.

Focus number

There are 4 focus zone adjustable Max. in B display mode, but the focus Nos. are also restricted by the depth of the image.

Adjust methods

Press **[FOCUS NUM/FOCUS POS/FREQ]** selection knob select **[FOCUS NUM]** the indicator of [FOCUS NUM] will be lit turn the knob to change focus Nos..Or move the cursor to the menu item **[focus num]** turn [MULTI] knob to change the focus Nos. and focus Nos. displays in the menu item directly.

Fig 6-6 FOCUS NUM/FOCUS POS/FREQ selection knob

Caution Focus Nos. can not be changed in frozen state.

: There is only 1 focus in M display mode, so Focus Nos. can not be changed in M ay mode.

Focus position

Press **[FOCUS NUM/FOCUS POS/FREQ]** selection knob select **[FOCUS POS]** the indicator of **[FOCUS POS**] light will be lit turn the knob to change Focus Position or move the cursor to**[focus pos]** turn [MULTI] knob to change the focus position.

When changing the focus position, multiple focuses move at the same time, and the focus can not be moved out of the image display area.

tion Focus position can not be changed in the frozen status.

Dynamic range

Dynamic range is used for adjusting the contrast resolution of B mode image,

compressing or enlarging the display range of gray scale.

The adjustment range of the dynamic range adjustment is 30 to 90, and adjustment level is 4dB/step.

Select the item-“Dynamic range” in B/M image menu to adjust “dynamic range” of B/M image, current dynamic value will be displayed on this menu item. The adjustment method is same as the acoustic power.

Caution Dynamic range cannot be adjusted when image is frozen.

B/M IMAGE MENU
A. POWER
FOCUS NO.
FOCUS POS
FREQ.
DYNAMIC
EDAGE ENHAN
SMOOTH
LIN. AVG
FRAME AVG.
SCAN LINE
POST PROCESS
PRESET
M IMAGE MENU
M SPEED
DYNAMIC
EDGE ENHAN
SMOOTH
LINEAR CORRE.
POST PROCESS

Fig 6-7 Adjusting dynamic rang of B/M image

Edge enhancement in B/M mode

Edge enhancement is used for enhancing the image outline in B/M mode. In this way the user can view the tissue structure more clearly. Its range is 1~3. 1 stands for no edge enhancement, and 3 stands for the maximum edge enhancement.
Select the item-“Edge enhancement” in B/M image menu to adjust “edge enhancement”, current the value of edge enhancement will be displayed on this menu item. The adjustment method is same as that of acoustic power.

Caution Edge enhancement cannot be adjusted when image is frozen.

Smoothness

Adjusting smoothness is used for restraining the image noise and performing axial smooth processing to make the image smoother.

Its range is 1~3. 1 stands for no smoothness processing, and 3 stands for the maximum smoothness processing.

Select the item-“Smoothness” in B/M image menu to adjust smoothness, current smoothness processing value will be displayed on this menu item. The adjustment method is same as that of acoustic power.

Caution□Smoothness cannot be adjusted when image is frozen.

Partial zoom function

Partial zoom function is available with the [Zoom] menu item and [MULTI] knob□This function is different in the different zooming mode according to sampling frame.

B IMAGE MENU
A. POWER
FOCUS NO.
FOCUS POS
FREQ.
DYNAMIC
EDAGE ENHAN
SMOOTH
ZOOM
FRAME AVG.
SCAN LINE
POST PROCESS
BIOPSY
PRESET

Fig 6-8 Zooming menu

The method for adjustment:

1. Select **[ZOOM] menu item**□ the indicator of **[ZOOM]** will be lit□and in the center of the screen, there is a circle for finding a view, like Fig6-9.
2. Move the trackball, zoom in the image with the center of view circle.
3. Press□SET□□the circle disappear□the zooming-in image appear in the screen.
4. Move the track ball, the zooming-in image move in the image widow.
5. Press □SET□ again□ to confirm the center of the zooming-in image, the cursor will appear.
6. Press the□SET□in the zooming menu, exit from the zooming state, resume the normal state image, □ZOOM□light goes out□

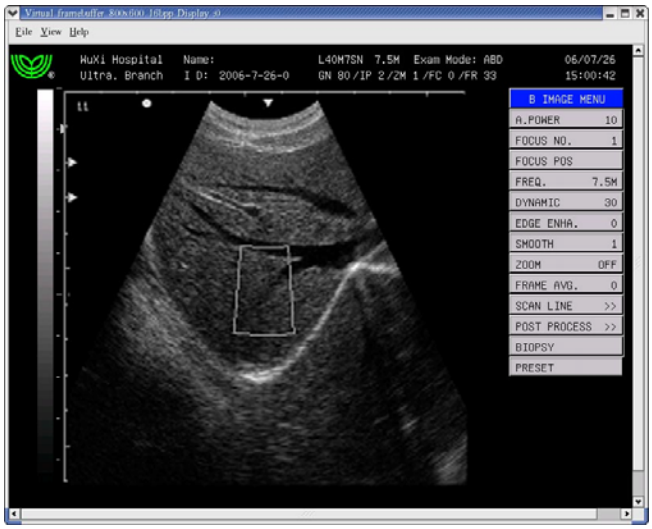


Fig 6-9 zooming-in image

Caution□The zooming-in function is not available in the frozen state.

Linear averaging

Linear averaging is used for restraining image noise and performing horizontal smooth processing to make image smoother.

Its range is 0~1. 0 stands for no linear averaging, and 1stands for the maximum linear averaging.

Select the **[Linear averaging]**□turn the knob to do adjustment. The current linear averaging value displays in the menu item. The adjustment method is same as that of the Acoustic power.

Caution□Linear averaging cannot be adjusted when image is frozen.

Frame correlation

Frame correlation function is to overlap and average the adjacent B mode images so as to reduce the imaging noise and make the image clearer.

Its range is 0~7. 0 stands for no frame correlation, and 7 stands for the adjacent continuous 8 frames of image to be overlapped and averaged.

Frame correlation is only valid on B mode image. Users can adjust the menu item-"Frame correlation" in B mode image menu, and the current frame correlation value will be displayed on this menu item. The adjustment method is same as the Acoustic power.

Caution□Frame correlation cannot be adjusted when image is frozen.

Linear correlation

Linear correlation function is to overlap and average the adjacent M mode scan lines so as to reduce the imaging noise and make the image clearer.
Its range is 0~1. 0 stands for no linear correlation processing in M mode image, and 1 stands for the continuous 16 M mode scan lines be overlapped and averaged.
Linear correlation is only valid on M mode image. Users can adjust the menu item-"Linear correlation" in M mode image menu, and the current linear correlation value will be displayed on this menu item. The adjustment method is same as the Acoustic power.

Caution Linear correlation cannot be adjusted when image is frozen.

M speed

M Speed function is to adjust the sweep speed of M mode image.
Its range is 1~4: 1 stands for the slowest M mode sweep speed, 4 stands for the fastest M mode sweep speed.
M Speed is only valid on M mode image. Users can adjust the menu item-"M Speed" in M mode image menu, and the current M Speed value will be displayed on this menu item. The adjustment method is same as that of Acoustic power.

Caution M Speed cannot be adjusted when image is frozen.

Scanning line mode

1.1.1.1 Scan line angle

Use scan line angle function to adjust the scan angle of the B mode image. This function is only valid on B mode image. The scan angle is related to the frame frequency. The smaller the scan angle is, the higher the frame frequency is.
Its range is 0~3: 0 stands for the smallest scan angle; 3 stands for the largest scan angle.
Users can adjust the sub menu item-"Scan angle" in "Scan line mode", and the current scan angle value will be displayed on this menu item. The adjustment method is same as that of Acoustic power.

Caution Scan angle cannot be adjusted when image is frozen.

B IMAGE MENU
A. POWER
FOCUS NO.
FOCUS POS
FREQ.
DYNAMIC
EDAGE ENHAN
SMOOTH
ZOOM
FRAME AVG.
SCAN LINE
POST PROCESS
BIOPSY
PRESET

Fig 6-10 Adjust the scan angle through the B image menu

1.1.1.2 Linear density and central line

Use line density function to adjust the density of the scan lines on B mode image. This function is only valid on B mode image. The line density has two types: high density and low density. High density means better image quality while low density image has high frame rate. The central line of high density and low density is the same with 80.

Users can adjust the sub menu item-"Line density" in "Scan line mode", and the current scan line density value will be displayed on this menu item. And the central line changes with the line density. The method to adjust is same as that of Acoustic power.

Caution Scan line density cannot be adjusted when image is frozen.

Post processing

Use post process function to adjust the gray scale of the image in order to obtain the user-desired visual effect.

Use post process menu to adjust the gray transformation curve, gray rejection curve and γcorrection on real-time respectively and to select either of the five kinds of preset post processing effect.

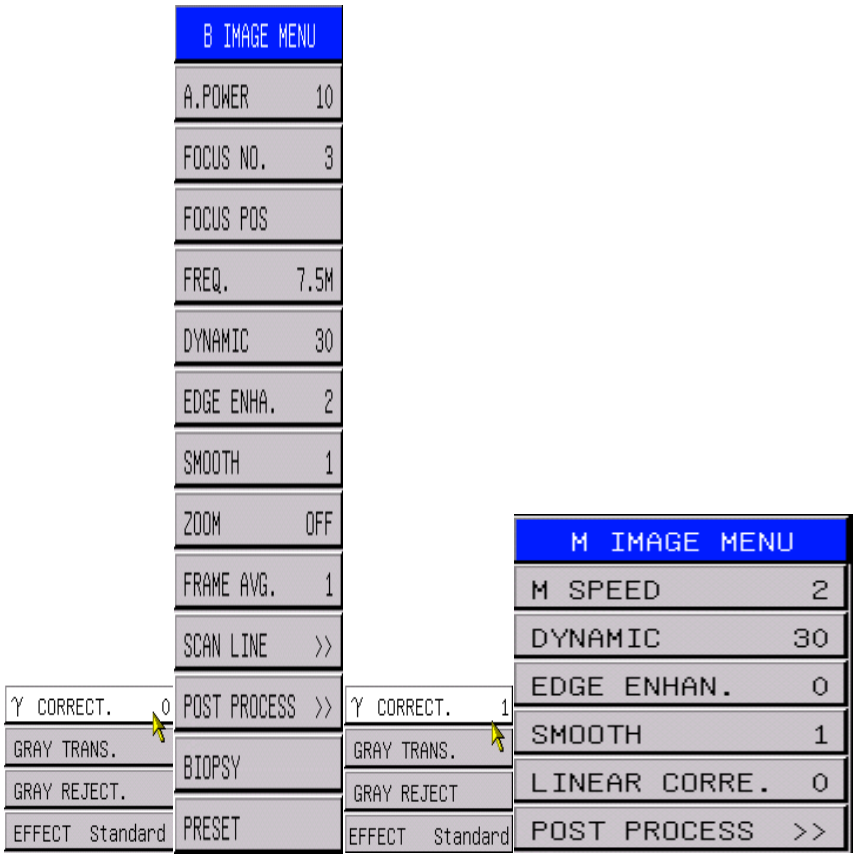


Fig 6-11 Post processing in B mode image menu and M mode image menu

Caution: The post process function is valid on real-time image, frozen image or cine-memory of B mode image. The post process of B mode image and M mode image is independent from each other, which can be adjusted by using the [Post processing] submenu respectively in the B mode menu and M mode menu.

1.1.1.3 γ correction

Used for correcting the visual non-linear distortion in image. The parameter values forγcorrection are 0, 1, 2, 3, which respectively represent that γcorrecting index is 1, 1.1, 1.2 and 1.3.

Adjust method:

Select the sub menu item□γcorrection□ of □Post processing□in B image menu, press □SET□key or □CANCEL□key to adjust theγcorrection value will be displayed in the menu item. The adjust method is same as that of Acoustic power.

6.2.13.2 Gray scale transformation curve□

Adjust method□
Select the sub menu item-"Gray scale transformation" in "Post processing", and a dialog box of adjusting gray scale transformation will appear, see Fig 6-12

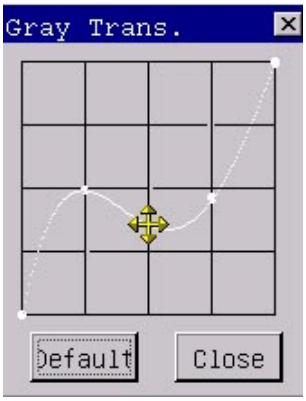


Fig 6-12 Dialog frame of adjusting gray scale transformation curve

Press [SET] key at node position and will be displayed as "✣", move trackball to adjust the curve setting, press [SET] key again at desire position to fix on curve, then press [SET] key to exiting dialog frame of adjusting gray scale transformation curve on the [SHUT] button or □×□; or press [SET] key to recover system default setting on the "Default" button .

1.1.1.4 Gray rejection curve:

Used for restraining image signals that below a certain lever of gray scale.
Adjust method□
Select the sub menu item-"Gray scale rejection" in "Post processing", after press □SET□key, a dialog box of adjusting gray scale transformation will appear, see Fig 6-13.

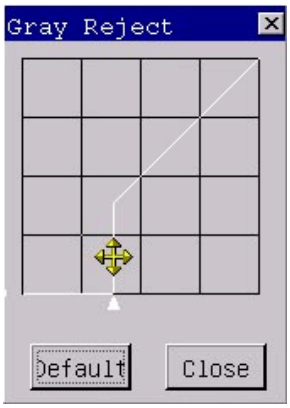


Fig 6-13 Dialog frame of adjusting the gray scale rejection curve

Press [SET] key at node position and will be displayed as "✣", move trackball to adjust the curve setting, press [SET] key again at desire position to fix on curve, then press [SET] key to exiting dialog frame of adjusting gray scale rejection curve on the [SHUT] button or □×□; or press [SET] key to recover system default setting on the "Default" button .

6.2.13.4 Effect

There are 5 post processing effects preset in the system, and each effect is the combination of gray scale transformation, gray scale rejection, and γcorrection. The 5 post processing effects are: Standard, High lever gray scale, Low lever gray scale, Equal lever gray scale, and Negative image.

From Standard to Negative image, contrast of image will increase gradually.
The effect of Post processing can track to adjust the sub menu item-"Effect" of "Post processing" in the B and M image, and the current effect value will be displayed in the menu item.

Chapter 7 Measurement and Calculation

Main content of this chapter:
Normal measurement and calculation including B mode and M mode image, OB measurement etc.

Keys used in measurement

Trackball

See 4.5.1

Dial key

See 4.11.2

MEAS

See 4.9.1

SET and CANCEL

See 4.5.2 and 4.5.3

Normal measurement and calculation in B, B/B and 4B mode

Press examination mode key - **[B] , [B/B] or 4B** to enter into B , B/B or 4B mode, B mode menu appears automatically in the right of the screen, then press **[MEAS]** to enter into measurement state.

Distance

Note: If no measurement item is selected, the default measurement item is distance measurement, press □SET□key to enter into measurement state.

Fig 7-1 B mode normal measurement menu and submenu

Measurement steps:

- Move cursor to menu option-“distance” in [B normal measurement] menu. Press□SET□key to enter into distance measurement.
- Use the trackball to move the cursor to the start point; Press □SET□key to fix the start point and the cursor is displayed as “□”.
- Use the trackball to move the cursor-“+” to the end point. There is a dotted line connecting the cursor-“+” to the start point “□”.
- Press □SET□key to fix the end point and the cursor is displayed as “+”. Now the measurement value is confirmed and the measurement performance is finished. Measurement value will display in the measurement result area, press □CANCEL□key to delete the end point.
- Repeat the step 2~4 to start next distance measurement, press □CANCEL□key to delete the previous measure step.

Note: There are 4 measurement values to show in right results window, if more than 4 measurements are performed, the 1st item will be covered and the current measurement value will display in the result window.

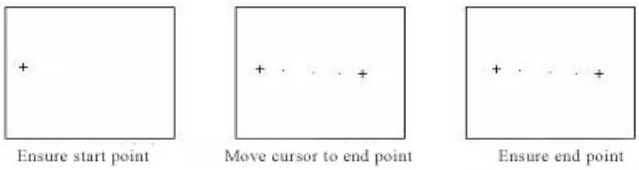


Fig 7-2 B Measure the distance

Circumference and Area---Ellipse

Measurement steps:

- Move cursor to menu option-“Circumference/area” , submenu – “Circumference/area” will display automatically, and move cursor to “Ellipse” menu item of submenu, press SET key to enter into measurement state, cursor will display as “+”.
- Use the trackball to move the cursor to the fixed axis start point of ellipse measurement area; Press SET key , cursor will display as “+” on the fixed axis start point, press CANCEL key to delete the start point.
- Use the trackball to move cursor to fixed axis end point of ellipse measurement area, There is a dotted line connecting the cursor-“+” to the start point, .Press SET key to fix the end point and the cursor is displayed as “+”
- Move cursor to adjust the axis length of ellipse, to make ellipse covers desired measurement area, the vertical distance of cursor to fixed axis
- Press SET key, to confirm the ellipse measurement area, the measure value will display in the measure result area, the current measurement is finished, press CANCEL key to delete the end point.
- Press SET key to start next “Circumference/area” measurement of Ellipse method, press CANCEL key to delete the previous measure step.

Note: There are 4 measurement values to show in right results window, if more than 4 measurements are performed, the 1st item will be covered and the current measurement value will display in the result window.

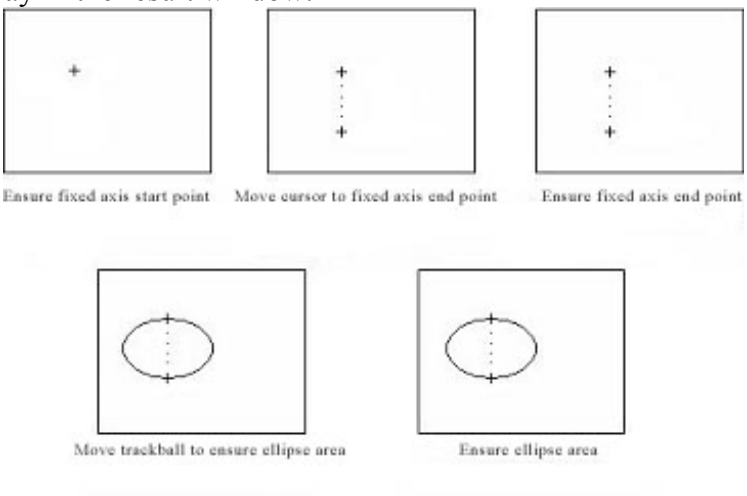

Ensure fixed axis start point
Move cursor to fixed axis end point
Ensure fixed axis end point
Move trackball to ensure ellipse area
Ensure ellipse area

Fig7-3 Measurement in Ellipse method

Circumference and Area---Trace

Measurement steps:

Move cursor to menu option-“Circumference/area” , submenu – “Circumference/area” will display automatically, and move cursor to “Ellipse” menu item of submenu, press SET key to enter into measurement state, cursor will display as “+”.

Move the cursor to start point of measurement, Press SET key , cursor will display as “+” on the start point of measurement, press CANCEL key to delete the start point.

□ Use the cursor to draw a trace along the edge of desired area, trochoid can not closed. □ Press □SET□key, the start point and end point of trochoid will close with one line, measure value will display in the measurement result area, the current measurement is finished, press □CANCEL□key to delete the end point.

□ Press □SET□ key, start next "Circumference/area" measurement of trace method, press □CANCEL□key to delete the previous measure step.

Note: There are 4 measurement values to show in right results window, if more than 4 measurements are performed, the 1st item will be covered and the current measurement value will display in the result window.

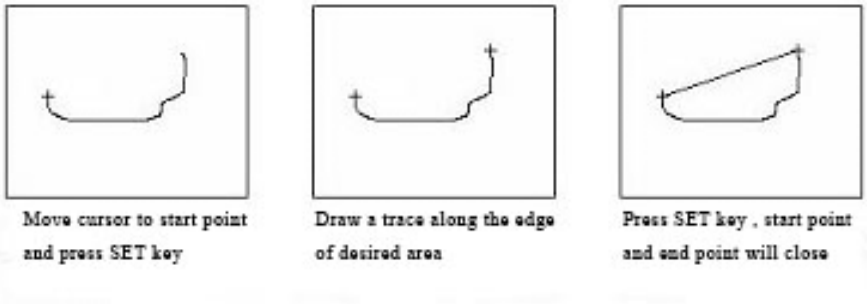

Move cursor to start point and press SET key
Draw a trace along the edge of desired area
Press SET key , start point and end point will close

Fig 7-4 Measurement in Trace method

Volume measurement (Two-axis method)

Two-axis method: Vertical profile of the target needs to be measured.

□The formula for Two-axis method:

$V = \pi/6 \times A \times B^2$

In the formula, A is the long axis of the ellipse and B is the short axis of the ellipse.

The measurement of volume by two-axis method is identical to circumference/are.

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

Volume measurement (Three-axis method)

Three-axis method: Both the vertical profile and the horizontal profile of the target need to be measured.

□The formula for Three-axis method:

$V = \pi/6 \times A \times B \times M$

In the formula, M is the length of the third axis.

Measurement steps:

□ In B mode, scan and freeze the image.

□ Move cursor to "Volume" menu item, submenu "Volume" will appear automatically, and move cursor to submenu of "Three-axis method " menu item, press □SET□ to enter into measuring state, cursor is displayed as "+".

□ Draw an ellipse which the size with to be measured area the same on the screen, the method of draw an ellipse is the same as that to Circumference/area (Ellipse method).

□ Defreeze the image, re-scan and display the profile perpendicular to the previous image. Then freeze the image and measure the length of the third axis. The method is the same as that to measure the distance.

 After the measurement, the measured result of the volume is displayed in the Result Window.

 Repeat the step 1 ~ 5 to start next measurement, press CAECELkey to delete the previous measure step.

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

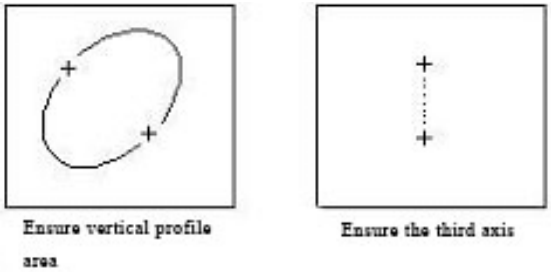


Fig 7-5 Volume measurement in three-axis method

Ratio measurement

Ratio measurement: To measure and calculate the ratio between two measured distance values. The first measured value is used as the numerator and the second measured value is used as the denominator.

Measurement steps:

 Move the cursor to the [Ratio] menu option, and press SETkey to select it. Move the cursor into the image window, the cursor is displayed as "+".

 Measure the first distance, measure the second distance. The method is the same as that to measure "Distance".

 After finishing the measurements, the final calculated result of ratio is displayed in the result window.

 Repeat the step 1-3 to start next ratio measurement, press CANCELkey to delete the previous measure step.

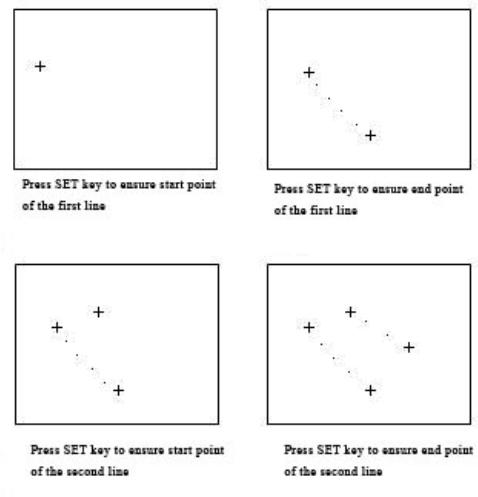

Press SET key to ensure start point of the first line
Press SET key to ensure end point of the first line
Press SET key to ensure start point of the second line
Press SET key to ensure end point of the second line

Fig 7-6 Ratio measurement

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

Angle measurement

Angle measurement: To measure the angle between two straight lines (0□90°).
Measurement steps:

- Move the cursor to the [Angle] menu option, and press □SET□key to enter into measuring state, Move the cursor into the image window, the cursor is displayed as "+".
- First draw a line along one edge of the angle, then draw a line along another edge of the angle. The method is the same as that to measure distance.
- After the measurements, the angle between two lines and the length of two lines are displayed in the Result Window.
- Repeat the step 1□3 to start next angle measurement, press□CANCEL□key to delete the previous measure step.

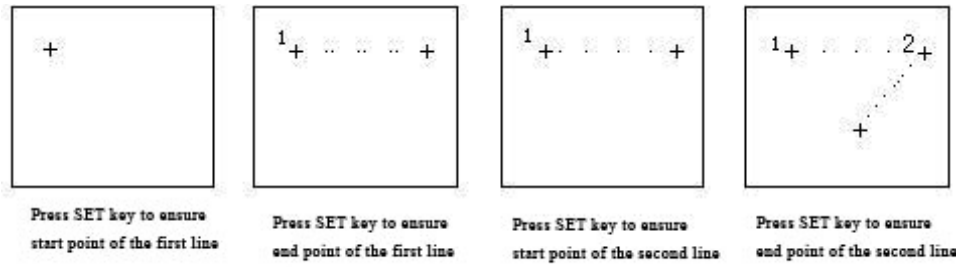

Press SET key to ensure start point of the first line
Press SET key to ensure end point of the first line
Press SET key to ensure start point of the second line
Press SET key to ensure end point of the second line

Fig 7-7 Angle measurement

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

% Stenosis Measurement

Function: To measure and calculate the stenosis degree of the blood vessels. The stenosis distance ratio and the stenosis area ratio are to be calculated according to the distance and area respectively.

□The formulae for % stenosis:

%D=□□D1-D2□÷D1□×100%
%A=□□A1-A2□÷A1□×100%

In the formulae, D1 and A1 respectively represent the distance and area at the non-stenosis position. D2 and A2 respectively represent the distance and area at the stenosis position.

Measurment steps for stenosis diatance ratio:

- Move the cursor to the [Distance % Stenosis] item of the [% STENOSIS] submenu, and press the [Set] key to select it. And the cursor is displayed as "+".
- Measure the distance D1 at the non-stenosis position. The method is the same as that to measure distance.
- Measure the distance D2 at the stenosis position. The method is the same as that to measure distance. After the measurements, the final calculated result of %D-stenosis distance ratio is displayed in the Result Window.
- Press the [Set] key to start a new measurement.

Measurement steps for stenosis area ratio:

- Move the cursor to the [Area % Stenosis] menu option of the [% STENOSIS] submenu, press the [Set] key to select it. And the cursor is displayed as "+".
- Measure the area A1 at the non-stenosis position. The method is the same as ellipse method of measuring "Circumference/Area".
- Measure the area A2 at the stenosis position. The method is the same as ellipse method of measuring "Circumference/Area". After the measurements, the calculated value of the stenosis area ratio is displayed in the Result Window.
- Repeat the step 1 ~ 3 to start a new measurement, press CANCEL key to delete the previous measure step.

Histogram

Function: To calculate the gray distribution of the ultrasound echo signals within a specified area. Use the rectangle, ellipse or the trace to close the area to be measured. The result is shown in the form of histogram.
Histogram can be measured only on the frozen image.

- Measurement steps by rectangular method:
  - Press FREEZE to freeze the image.
  - Move the cursor to the [Histogram] menu option, and the [Histogram] submenu will appear. Move the cursor to [Rectangle] and press SET key to select it. The marker "+" appears when the cursor is moved on the image.
  - Move the cursor to the start top point of the rectangle, and press SET to fix the point.
  - Use the trackball to move the cursor, and see a rectangle scale displayed at real time.
  - Press SET to fix the diagonal point of the rectangle and fix the measurement area of the diagram. The calculated result of the histogram is displayed in the upper right corner of the image window. To exit dialog box, press OK or press SET after move the cursor on × on right upper of the dialog box.

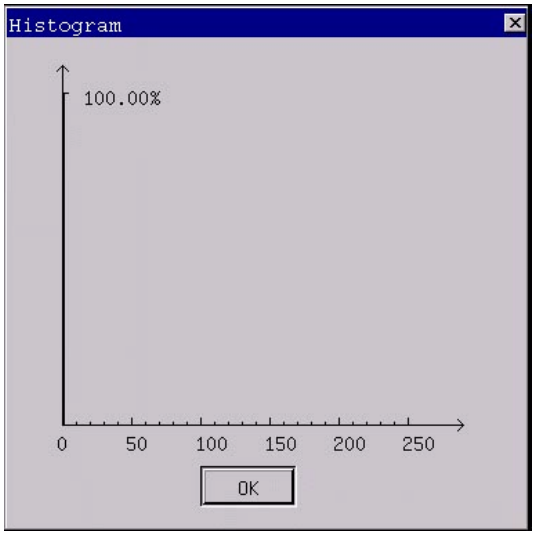


Fig7-8 Measurement value for Histogram

- To measure the histogram by ellipse or trace methods, the method is the same as that to measure "circumference/area".

The measured result of the histogram is shown as in Fig 7-8, in which the horizontal-axis represents the gray scale of the image ranging from 0 to 255 and the vertical-axis represents the distribution ratio of each gray scale. The maximum value on the left represents the percentage of the maximally distributed gray in the whole gray distribution.

Profile

Function: To measure the gray distribution of the ultrasound signals in the vertical or horizontal direction on a profile, being shown as profile diagram.
Measuring the profile is available in the frozen image.

Measurement steps:

- Press □FREEZE□to freeze the image.
- Move the cursor to the [Profile] menu option and press the □SET□ key to select it. Move the cursor into the image window, and the cursor is displayed as "+".
- Draw a straight line at the measuring position. Refer to the method to measure distance.
- The profile is displayed in the window.
  Horizontal axis----the projection of the profile line on the horizontal direction.
  Vertical axis----the gray distribution of the corresponding points on the profile line. The range is 0 to 255.
- Press the [Set] key to start a new measurement.

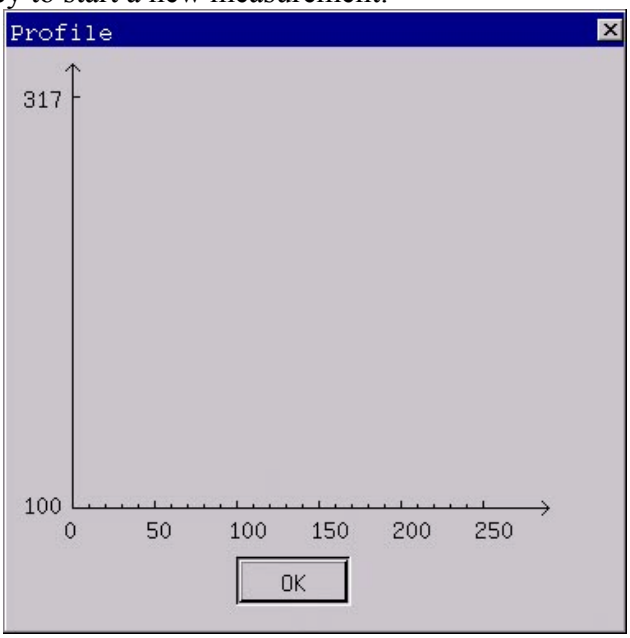


Fig 7-9 Measurement value in the profile

Normal measurement and Calculation –M□B/M mode

Press [M] or [B/M] to enter the B or B/M mode, the "M mode menu" or "B/M mode menu" appears automatically at the right□press [MEAS] to enter the measurement status.

Distance

Note: If the measure item is not selected, the default measurement is [Distance], press □SET□ key to enter the measurement status.

M Normal measurement
Distance
Time
Velocity
Heart rate

Fig 7-10 M normal measurement menu

Measurement steps:

- Move cursor to menu option-"distance" in [M normal measurement] menu. Press □SET□key to enter into distance measurement.
- Use the trackball to move the cursor to the start point, press □SET□key, and display as "-" on the start point. It will appear one vertical broken line, and appear one horizontal line and along with the cursor to move, press □CANCEL□key to delete the start point.
- Use trackball move cursor to the end point, press □SET□ key, and display as "-" on the end point, through start point to end point, the primary vertical broken line will translate the vertical real line, press □CANCEL□key to delete the end point.
- Measurement value will confirm finally, the current measurement finish, the measurement value will be displayed in the result window.
- Press □SET□ key, start next distance measure, press □CANCEL□ key to delete the previous measure step.

Note: There are 4 measurement values to show in right results window, if more than 4 measurements are performed, the 1st item will be covered and the current measurement value will display in the result window.

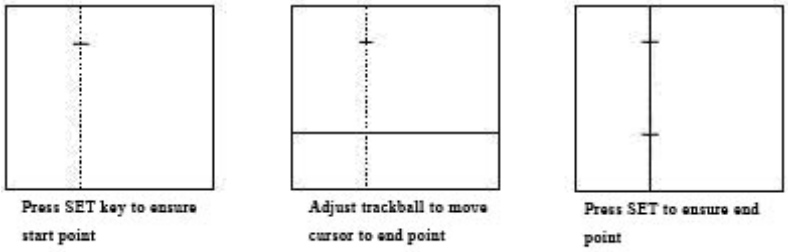


Fig 7-11 Distance measurement

Time

Measurement steps:

- Move cursor to [Time] menu item, press □SET□key enter into measurement status, move cursor into image window, the cursor will be displayed as a big "+".
- Move cursor to the start point, press □SET□key and will be displayed one vertical broken line on the start point, and appear one vertical line and along with cursor to move, press □CANCEL□key to delete the start point.
- Use trackball, move cursor to end point, press □SET□key, and will be displayed a vertical line on the end point, press □CANCEL□key to delete the end point.
- Measurement value will confirm finally, the current measurement finish, the measurement value

will be displayed in the result window.

- Press □SET□ key, start next distance measure, press □CANCEL□ key to delete the previous measure step.

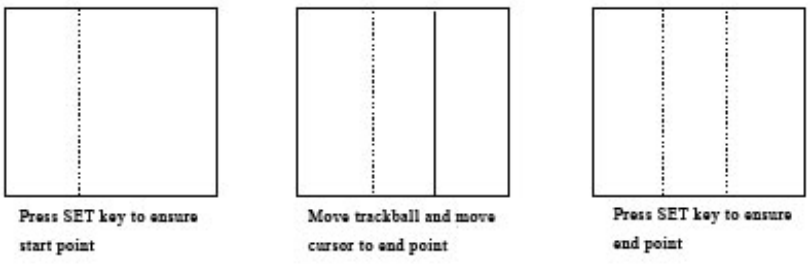


Fig 7-12 Time measurement

Note: There are 4 measurement values to show in right results window, if more than 4 measurements are performed, the 1st item will be covered and the current measurement value will display in the result window.

Heart rate

Function: To calculate the number of heart beats per minute on the cardiac image.
Measurement steps:

1. Move the cursor to the [Heart rate] menu option, press□SET□ key to select it. The cursor will be displayed as a big "|".
2. The measurement steps are the same as those to measure M mode time.
3. After the measurement, the calculated heart rate result is displayed in the result window.
4. Press the □SET□ key to start a new measurement, press □CANCEL□key to delete the previous measure step.

Note: There are 4 measurement values to show in right results window, if more than 4 measurements are performed, the 1st item will be covered and the current measurement value will display in the result window.

OB/GYN examination measurement and calculation

Normally OB calculations are performed in B mode image. Press [OB/GYN] key to enter into OB/GYN exam mode. Press [Measure] function key , appear animal category selection menu, select relevant animal, enter into measure model.

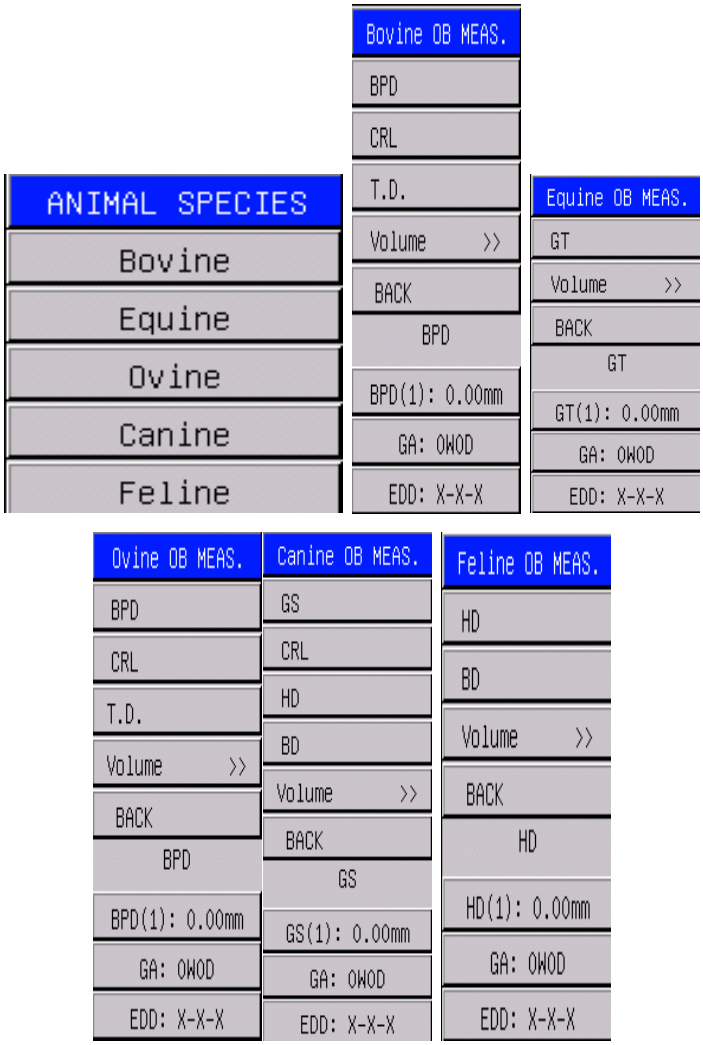


Fig 7-13 OB/GYN calculation menu and submenu

Fetal growth measurement

Take the bovine fetal growth, EDD and volume measurement as the example. Bovine measure parameters can choice BPD, CRL and T.D.
The EDD measure method:

- Move the cursor to the adoptive parameters menu option, and press the □SET□ key to enter into measure status, and move the cursor into the image window and it will be displayed as "+".
- The measure method is refer to the "Distance" measurement.
- The result of measured Gestation age and EDD will be displayed in the result window.
- Press □SET□key to start next measurement.

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.
The volume measure method:

- Move the cursor to the volume measurement menu option, select the needed adoptive parameters menu items, and press the □SET□ key to enter into measure status, and move the cursor into the image window and it will be displayed as "+".
- The measure method is refer to the "Distance" measurement.

- The result of measured will be displayed in the result window.
- Press □SET□key to start next measurement.

7.5 Small parts measurement and calculation

Exam item and measurement calculation are refer to the measurement calculation of B, B/B and 4B state.

7.6 Urology measurement calculation

Normally urology measurement are performed in B and B/B mode. Press □UROLOGY□ key to enter into urology exam mode. Press □MEAS□key to start measurement, the system is default to choice the residual urine volume measurement.

7.6.1 Residual Urine Volume measurement

To measure the wide diameter, thick diameter and high diameter of the bladder, then to calculate the residual urine volume.

- Formula: Volume = 0.7×wide diameter×thick diameter×high diameter

Measurement steps:

- Move the cursor to the [Residual urine volume] menu option, and press □SET□key to select it. Move the cursor into the image window, the cursor is displayed as "+".
- Respectively measure the wide diameter, thick diameter and high diameter of the bladder. The method is the same as that to measure distance.
- After the measurements, the calculated result of the residual urine volume is displayed in the Result Window.
- Repeat the step 1 ~ 3 to start next measurement, press □CANCEL□to delete the previous measure step.

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

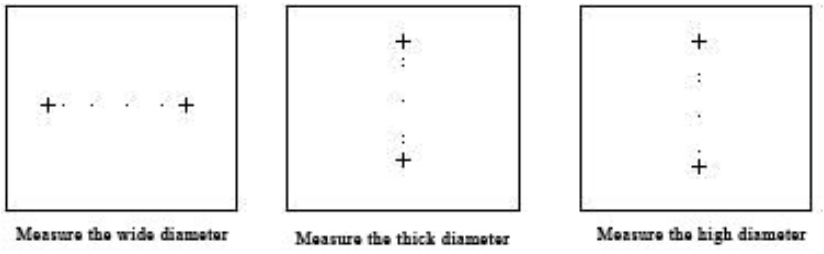


Fig 7-21 Residual Urine Volume measurement

7.6.2 Input SPSA(Serum Prostate Special Antigen)

SPSA is stand for the Serum Prostate Special Antigen, it can use to measure prostate.

Move the cursor to the **[SPSA]** menu option, and press □SET□key to select it; A dialog box appears, see Figure below, input SPSA value (the range is from 0.01~100) and press □SET□key on the "OK", finish input SPSA data and exit the dialog box; press □SET□key on the "CANCEL" or "×" of right upper of dialog box to exit the dialog box.

Fig. 7-22 Dialogue box of input SPSA

7.6.3 Prostate measurement

To measure the wide diameter, thick diameter and high diameter of the prostate, then to calculate the prostate volume,PPSA and PSAD

- Formula: Volume = 0.52×L×W×H□PPSA□0.12×V□PSAD□SPSA÷V

Measurement steps:

- Move the cursor to the [prostate] menu option, and press □SET□key to enter into measurement state. Move the cursor to the image windows and the marker "+" appears.
- Measure each item: wide diameter, thick diameter and high diameter of the prostate one by one. The method is the same as that to measure distance.
- After all displayed items are measured, the value of PV, PPSA, PSAD will be automatically displayed in the result window.
- Repeat step 1~3 to start next prostate measurement, press □CANCEL□to delete the previous measure step.

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

7.6.4 Measurement of Left Kidney and Right Kidney.

To measure the wide diameter, thick diameter and high diameter of kidney, then to calculate the volume of kidney.

- Calculation Formula: Kidney volume=0.52×Length×Width× Height

Measurement steps:

- Move the cursor to the "Left and Right Kidney Measurement" menu option, then move the cursor to the submenu "Left Kidney Volume" and press□SET□ key to enter measurement status, move the cursor on the image and the marker "+" appears.
- Measure each item: Length, Width and Height one by one. The method is the same as that to measure distance.
- After measured, the value of Left Kidney volume will displayed in the result window.
- Repeat the step 1□3 to start next Left Kidney Volume measurement, press □CANCEL□key to delete the previous measure step.

The method of Right Kidney Volume is the same as that to measure Left Kidney Volume.

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

3.7 Cardiology measurement and calculation

Cardiology examination measurement is normally performed in M mode or B/M mode.

3.7.1 Measurement in M mode

Press□M□to enter into M mode or press □B/M□ to enter into B/M mode.

Press □MEASURE□to enter into cardiology examination measurement of M mode.

Fig 7-23 Cardiac Measurement menu in M mode

1.1.1.5 Distance

Same as “Distance” measurement in the M mode or B/M mode.

1.1.1.6 Heart rate

Same as “Heart rate” measurement in the M mode or B/M mode.

1.1.1.7 Ejection Time

Same as “Time” measurement in the M mode or B/M mode

1.1.1.8 LVMW

The weight measurement of the left ventricle muscle is to measure WTD and IVSTD and then calculate to get the weight of LVMW .
The measurement method is the same as distance measurement in M□B/M status.

1.1.1.9 Left ventricular function

In M mode, there are two formulae available for the calculation of cardiac volume: Teichholz formula and Feigenbaum formula.

- Teichholz formula:

$V=7.0*D^3/(D+2.4)$

◆ Feigenbaum formula:

$V=D^3$

In the above two formulae, V represents the left ventricular volume and D represents the left ventricular diameter.

Measurement steps:

- Move the cursor to “Left ventricular function” in “M Cardiology measurement” menu, and press SET to select it. Then select [Teichholz]or [Feigenbaum] in the appeared submenu, press SET and the cursor is displayed as a big “+”.
- Move the cursor to the left ventricular end systolic period to measure ESD-left ventricular diameter at end systolic period.. The method is the same as “Distance” measurement of M normal measurement. Then the measured value of ESD and calculated result of ESV are displayed in the result window.
- Move the cursor to the left ventricular end diastolic period to measure EDD-left ventricular diameter at end diastolic period. The method is the same as “Distance” measurement of M normal measurement. The measured value of EDD and the calculated value of EDV are displayed in the result window.
- After measured EDD, it will display the calculation result of SV, EF and FS at the same time.

Note: There are 1 measurement values to show in right results window, the second measurement value will cover the current result automatically and will display in the measurement result area.

3.7.1.1 Mitral valve measurement

◆ Measurement methods of EF Speed, AC descending speed, Ratio of the A and E waves:

Fig 7-24 Submenu of mitral valve measurement

◆ Measurement methods of EF Speed, AC descending speed, Ratio of the A and E waves:

 Move the cursor to “Mitral valve” menu option, and the submenu will appear. Move the cursor to “EF Speed”, or “AC speed”, or “A / E” , press SET to select it. The cursor is displayed as a big “+”.

 To measure “EF Speed” just as measure “Slope ” in “M normal measurement”.

 To measure “AC speed” just as measure “Slope” in “M normal measurement”.

 To measure “A / E ” , Respectively measure the amplitude of wave A and wave E. The method is the same as the “Distance” measurement in “M normal measurement”. After the measurements are finished, the calculated values are displayed in the result window.

◆ Calculate QMV (Mitral valve volume)

Measurement steps:

 Move the cursor to “QMV” in “Mitral valve measurement”, and press SET to select it. The cursor is displayed as “+”.

 First measure the open speed of mitral valve-DEV, just as measure “Slope” in “M normal measurement”.

 Then measure the open time of mitral valve-DCT, just as measure “Time” in “M normal measurement”.

The QMV value- Mitral valve volume will be displayed in the result window.

Calculation formula:

QMV=4*DEV*DCT

In the above formular, DEV represents the mitral valve’s opening speed and DCT is opening time.

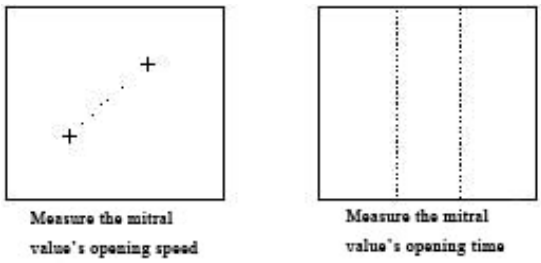


Fig 7-25 Measurement for the mitral valve

3.7.1.2 Aortic valve measurement

Measurements items: Ratio of left atrium dimension and aortic root dimension (LAD/AOD) and aorta valve volume (AVSV).

- Measurement steps -LAD/AOD:
- Move the cursor to “Aortic valve measurement” in “M Cardiology measurement” menu option. Then move the cursor to “LAD/AOD” submenu option and press SET to select it. The cursor is displayed as “+”.
- Respectively measure LAD and AOD just as measure “Distance” in “M normal measurement”.
- The calculated LAD/AOD result will be displayed in the result window.

  Note: The measurement area can most show 1 value. And the second one will cover the earlier and show in the measurement area.
- Measurement steps -Aorta valve volume (AVSV).

Only after LVET is measured or entered, the system can calculate AVSV.

Calculation formula:

AVSV= (MAVO1+MAVO2)*LVET*50+AA

In this formula:

MAVO1: The opening diameter of the aorta valve at the beginning.

MAVO2: The opening diameter of the aorta valve at the end.

AA: the amplitude of aorta posterior wall.

Measurement steps:

- Move the cursor to “Aortic valve measurement” in “M Cardiology measurement” menu option. Press SET. Then move the cursor to “AVSV” submenu option and press SET to select it. The cursor is displayed as “+”.
- Measure MAVO1 firstly just as measure “Distance” in “M normal measurement”.
- Measure MAVO2 secondly just as measure “Distance” in “M normal measurement”.
- Then measure AA just as measure “Distance” in “M normal measurement”.
- After the measurements are finished, the calculated values are displayed in the result window.

3.7.1.3 Calculate CO-Cardiac output

After measurements of the left ventricular function are finished, the system can calculate CO either using the measured heart rate value or using the entered heart rate value.

- Measure heart rate
- Move the cursor to “Heart rate” in “M Cardiology measurement” menu option. Press SET to select it. The cursor is displayed as “+”.
- Measure heart rate the same as measure “Heart rate” in “M normal measurement”.
- After the measurements are finished, the measured heart rate value and the calculated CO value are displayed in the result window.

- Key-in heart rate

Heart rate value can be inputted directly as following steps:

- Move the cursor to “Key in” in “M Cardiology measurement” menu option Press SET. Then move the cursor to “Heart rate” submenu option and press SET to select it. A dialog frame for inputting heart rate will appear at the center of the screen.
- Input heart rate value(times/minute)
- Move the cursor to “OK” button in the dialog, and press SET to confirm it. The calculated CO value will be displayed in the result window.

The method to measure heart rate is the same as “Heart rate” measurement in M mode.

3.7.1.4 Calculating MVCF-mean velocity of circumferences

After measurements of the left ventricular function are finished, the system can calculate MVCF either using the measured LEVT or using the entered LEVT.

◆ Measure LEVT -Ejection time

- Move the cursor to “Ejection time” in “M Cardiology measurement” menu option. Press SET to select it. Move the cursor to image window and the cursor is displayed as “+”.
- Measure ejection time just as measure “Time” in “M normal measurement”.

After the measurements are finished, the measured ejection time value and the calculated MVCF value are displayed in the result window.

 Key-in Ejection time

Ejection time value can be inputted directly as following steps:

- Move the cursor to “Key in” in “M Cardiology measurement” menu option Press □SET□. Then move the cursor to “Ejection time” submenu option and press □SET□to select it. A dialog frame for inputting ejection time will appear at the center of the screen.
- Input ejection time value (ms)
- Move the cursor to “OK” button in the dialog, and press□SET□to confirm it. The calculated MVCF value will be displayed in the result window.

  For Ejection time, please refer to the measurement of Ejection time in M mode.

1.1.1.10 Calculate CI-Cardiac Index, and SVI-Stroke Volume Index

After measurements of the left ventricular function are finished, the system can calculate CI and SVI by entering values of height and weight.

◆ Key-in height and weight□

- Move the cursor to “Key in” in “M Cardiology measurement” menu option Press □SET□. Then move the cursor to “Body height and weight” submenu option and press□SET□to select it. A dialog frame for inputting body height and weight will appear at the center of the screen.
- Input body height (cm) and weight (kg).
- Move the cursor to “OK” button in the dialog, and press□SET□to confirm it. The calculated CI value, SIV value and BSA (Body Surface Area) value will be displayed in the result window.

3.7.2 Measurement in B mode

It is relatively accurate to measure the left ventricular volume on a two-dimensional echocardiography, especially on B/M mode image.
Please make sure the cardiology measurement is performed in cardiology exam-mode.

If not, press □CARDIAC□and select “Cardiology” exam-mode.

Press□M□to enter into B/M mode .

Press □MEASURE□to enter into cardiology examination measurement.

1.1.1.11 Distance

Same as “Distance” measurement in B mode or B/B mode.

1.1.1.12 Calculate SV-Stroke Volume□EF-Ejection fraction

The measurements and calculations of SV and EF on B mode image are all performed based on the calculated results of both left ventricular end systolic volume and left ventricular end diastolic volume. However, for different formula applied, the parameters to be measured are different.

There are four formulae available for calculating left ventricular volume on B mode image.

- Modified SIMPSON formula:

V=□Am+5*Ap/18□*L

In the above formula:

Am represents short axis area of left ventricular at the level of mitral valve.

Ap represents short axis area of left ventricular at the level of papillary muscle.

L represents the long axis diameter left ventricular.

- Single-plane Ellipse formula:

Measure on the long axis of left ventricular view (cardiac apex two-chamber or four-chamber view). The left ventricular volume is calculated based on the formula below:

$V=\square\pi/6\square*L*D^2$

In the above formula:

L represents the long axis diameter of left ventricular.

D represents the short axis diameter of left ventricular.

- Bi-plane Ellipse formula:

After obtaining the short axis profile at the level of mitral valve and cardiac apex two-chamber, the system calculates the left ventricular volume based on the formula below:

V=□8/3□*Am*Ai/□π*D□

In the above formula:

D represents the short axis diameter of left ventricular

Am represents the left ventricular area at mitral valve level view.

Ai represents the left ventricular area at the apex level view.

- Bullet volume formula

After obtaining the short axis view at the level of mitral valve and cardiac apex two-chamber or four-chamber view, calculate the left ventricular volume based on the formula below:

V=□5/6□*Am*L

In the above formula:

Am represents the left ventricular area at mitral valve level view.

L represents the long axis diameter of left ventricular.

Measure the left ventricular function by single-plane ellipse:

- Move the cursor to “Left ventricular function” in “B Cardiology measurement” menu option. Press□SET□to select it. Then move the cursor to “Single-plane” submenu and press □SET□. The cursor is displayed as “+”.
- At the left ventricular end systolic period, respectively measure following parameters:

Long axis diameter SL. The method is the same as the Distance measurement in B Normal measurements.

Short axis diameter SD. The method is the same as the Distance measurement in B Normal measurements.

□ At the left ventricular end diastolic period, respectively measure following parameters.

Long axis diameter DL. The method is the same as the Distance measurement in B Normal measurements.

Short axis diameter DD. The method is the same as the Distance measurement in B Normal measurements.

The EDD-End diastolic diameter and EDV-End diastolic volume will be displayed in the result window.

□ When DD is measured, the SV value and EF value will be calculated and displayed at the same time.

Chapter 8 Cine Memory

This chapter introduces the theory of storing image in cine-memory and the operation of back-playing the cine loop.

Store the real-time image

In the real time state, images in B-mode can be stored in the cine-memory at the unit of frame in time sequence. If the storage is full of images, when store a latest new image, the first saved image will removed out of cine-memory. So, there are always the latest images in the storage. All the images can be played back manually or automatically played back at the frozen state.

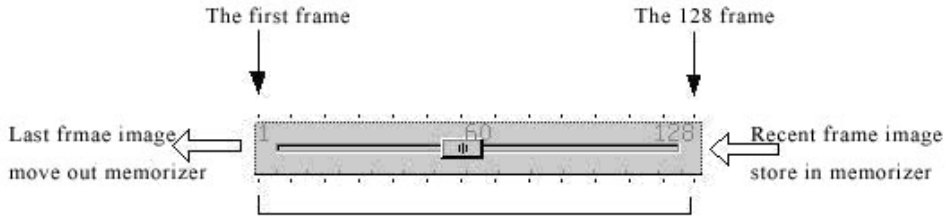


Fig 8-1 Indicator of back-play of cine-memory

Manual playback

The default playback method of cine-memory is by manual.

Press □FREEZE□ key to freeze image at real-time status. At this time the CINE key will be active. [CINE] key gets back-lit and the B frozen menu appears. The system will enter into manual playback of cine-memory status, please refer to the following fig..

Turn the track ball to forward or backward observe the image stored in the Cine-memory. If turn the trackball to the right, the images will be displayed at the increasing sequence of Frame No., which means the sequence of playback is same as the sequence of saving these images. If turn the trackball to the left, the images will be displayed at the decreasing sequence of Frame No.

Fig 8-2 B frozen menu in B mode

The indicator of cine-memory will appear in the lower place of the image, indicating the frame No. of playback and the total frames. Please refer to the figure as follows:

Fig 8-3 Indicator of the cine playback

In the manual playback status, press □CINE□key and □CINE□ key will get dark, then the system exit from the manual playback status.

Automatic playback
In the manual play back status, press □CINE□ to exit. Move the cursor to [Playback/ Stop] in the B frozen menu□turn the □MULTI□ knob clockwise to start the automatic playback function, at this time the images stored in cine-memory will be displayed at the increasing sequence of Frame No.. When turn the knob anticlockwise, the system will stop automatic playback function.
Before or during automatic playback status, the speed of automatic playback can be changed through the [playback speed] in the B frozen menu by turning the □MULTI□ knob. The current speed shows at the right of the menu option, the range of playback speed is from 1 to 4.

Other playback
Zooming-in images can be stored in the cine-memory and can be played back at frozen status, the operation is the same as that of playing back normal images

The following operation can be made on the image in cine-memory: zoom in, change the effect of post-processing, do the measurement, add annotation and body mark etc.

Chapter 9 Annotation

Introduction

Annotation can do the function of marking and explanation by input of the characters or symbols on the image.

Enter into annotation status:
Press□COMMENT□key, enter into annotation status and□COMMENT□key will be back-lit
Move the cursor to the desired position of the image that needs to be annotated with trackball. Press □SET□key and a reversing input box appears and the cursor changes as twinkling "|".

Fig 9-1 COMMENT key

Exit from annotation status□In the annotation status, press □COMMENT□key or other running mode key to exit from annotation status and the □COMMENT□key will get dark.

Adding annotation can be made through the keyboard or recalling in-built annotation database. The annotation database of the system is classified as following according to exam mode:

Classification	Function description
Abdomen(normal)	Anatomy terms for Abdomen or general exam
Obstetric	Anatomy terms for Obstetric
gynecologist	Anatomy terms for Gynecology
Cardiac	Anatomy terms for Cardiac
Small parts	Anatomy terms for Small parts
Pathological change	Normal terms for pathological change of Abdomen, Obstetric, gynecology, Cardiac and small parts

Caution: Annotation can be added in the image area or the zooming-in image area.

Input characters
Operation:

1. Press□COMMENT□ key to enter into annotation status.
2. Move the cursor to desired position.
3. Input the normal character through the keyboard. When inputting such characters(such as"♀"□"♂")□Please press □SHIFT□first, then press the corresponding keys to input, the first 20 characters will be shown on the screen.
4. Press □COMMENT□to exit from annotation status, □COMMENT□will get dark, finish annotation.

Input the annotation from the database

Operation□

1. At the annotation status, move the cursor to the required position in the image, press□CANCEL□ and a dialogue box of annotation database appears on the screen, see Fig9-2.
2. Move the cursor to the required item of annotation data, press□SET□, all the relevant annotation terms appear in the right part of the dialogue box. Move the cursor to the required annotation term. Then move the cursor to [OK] and press □SET□to confirm it. The dialog box will disappear and the selected annotation term will be inserted into the required position that the cursor located.
3. If do not want to input any annotation when opening the box, press □SET□on [Cancel] button or [×] to close dialogue box.

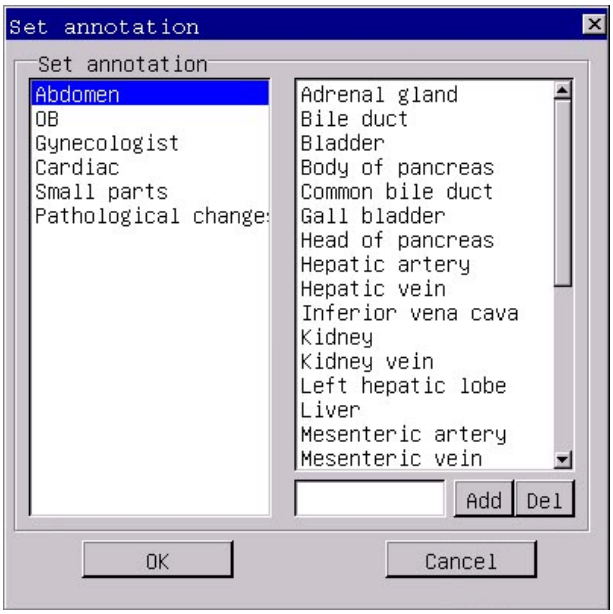


Fig 9-2 Dialog frame for the annotation

8.1 Clear the annotation

A. Clear the inputted characters

At the annotation status, move the track ball or □→□, □←□, □↑□, □↓□to locate the cursor on the right side of the character needed to be cleared, and press□←□ to clear the inputted characters.

B. Clear all the annotation

Press □CLR□ key to clear all the inputted characters.

Caution: Press□CLR□to clear all the measurement and the body marks at the same time.

Chapter 10 Body marks

Introduction

Body mark is used to point out the body part being examined and the detecting direction of the probe. In fact the body mark acts as a comment on the image.
Five categories of body mark are available: Bovine, Equine, Ovine, Canine and Feline. Each category has different body marks. See the following figures.

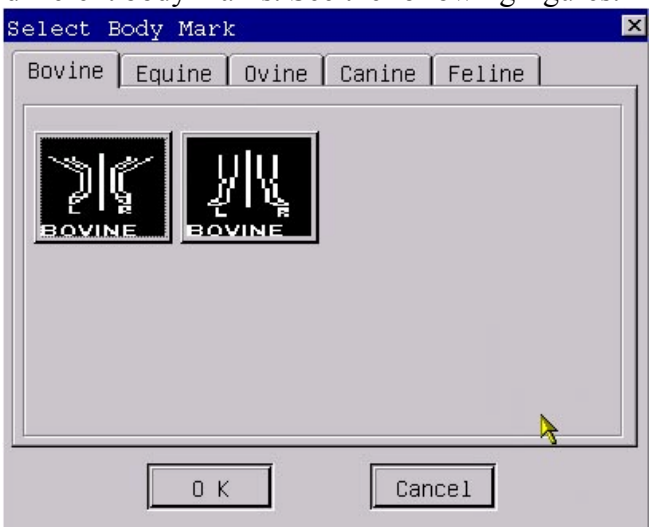


Fig10-1 Bovine body marks

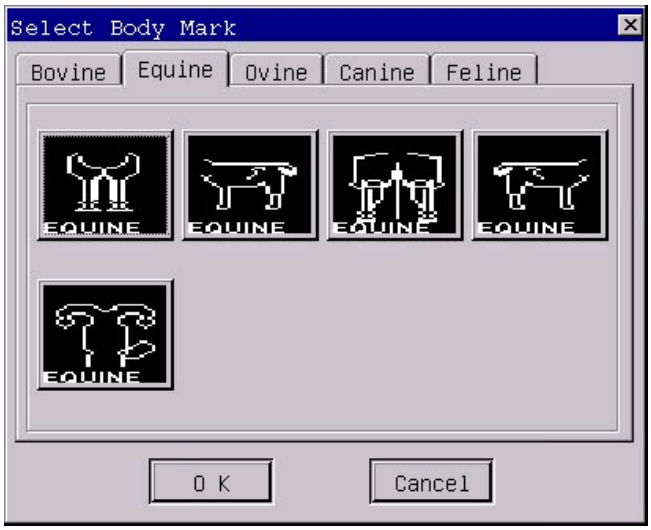


Fig. 10-2 Equine body marks

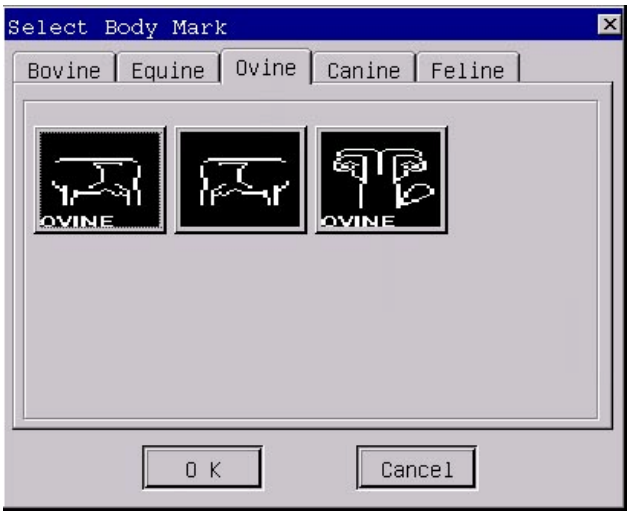


Fig. 10-3 Ovine body marks

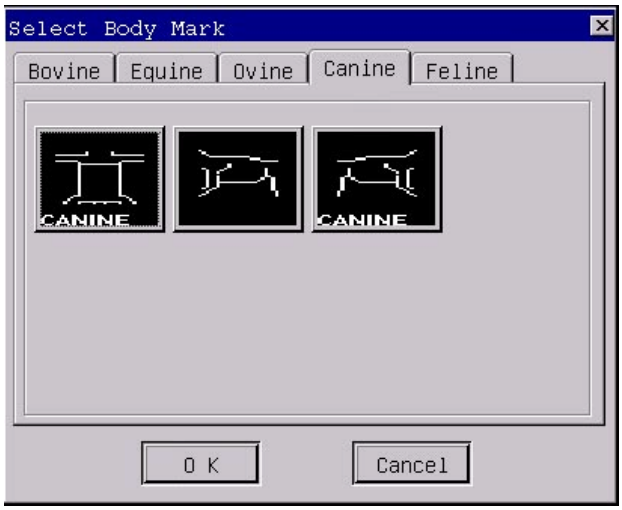


Fig. 10-4 Canine body marks

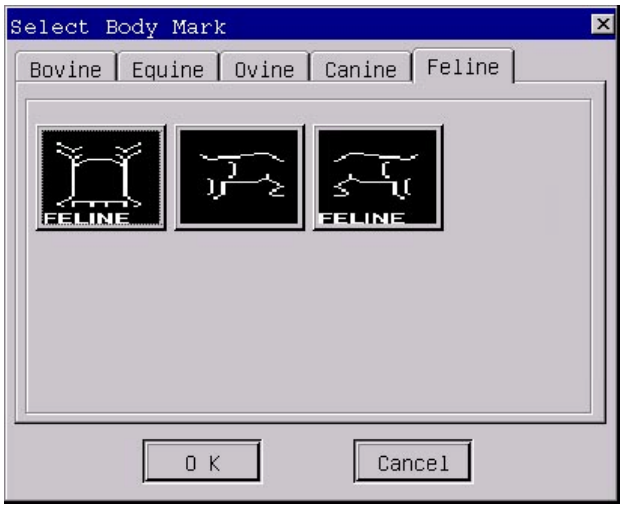


Fig. 10-5 Feline body marks

In the frozen status, press □BODY MARK□ and enter working status of body mark, the□BODY MARK□key will be back-lit and dialog box of body marks appears. When the operation of adding body mark is completed, the system will quit from working status of body mark automatically.

Fig 10-6 BODY MARK key

8.2 Operation of Body marks

Operation□

1. Press □FREEZE□ to freeze the image□press□BODY MARK□, the □BODY MARK□key will be back-lit and the dialog box of body marks will appear.
2. Move the cursor to the required body mark, press□SET□ to close the dialog box of body mark. Then the body mark appears in the image with the marker " " on the left. Use the track ball to move the body mark to the required position, and press □SET□to fix the probe position and the direction.
3. Press□SET□key to confirm the selected body mark.□BODY MARK□key will be not lighted after adding body mark, and the system will exit from the body mark working status.
4. When the dialog box of body marks is opened, if do not want to add any body mark, press □SET□after moving the cursor on the [CANCEL] button directly, then the dialog box will be closed.
5. To clear the added body mark, press□CLR□and the inputted body mark disappears.

Note: 2 body marks can be added on two images respectively in B/B mode. To clear all the measurement and the annotation in the image area, Press□CLR□ key. When the operation of clearance is performed, the body mark in the B/B mode can be cleared at the same time.

□2□ Chapter 11 Biopsy

11.1 Enter / Exit Biopsy status

Enter into the Biopsy status :

Press [BIOPSY] in the real-time status of B image, it will display biopsy down-lead in the image area, see figure below.

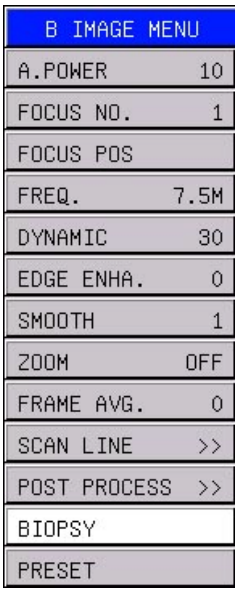


Fig.11-1 Biopsy menu

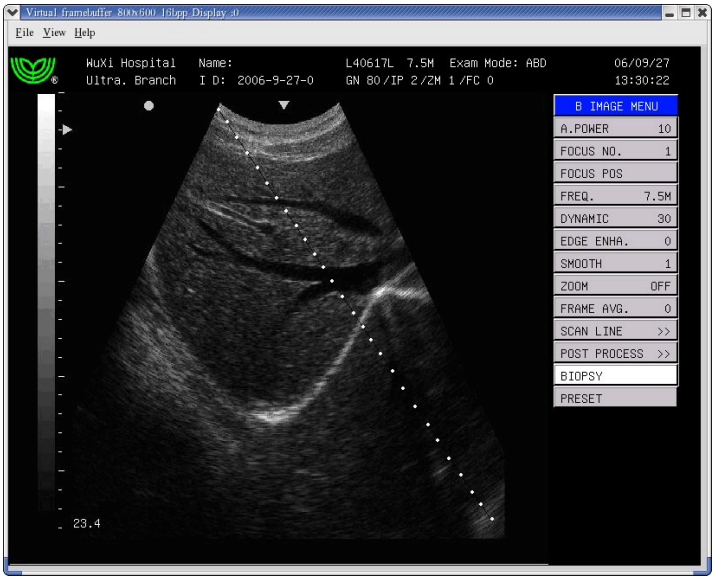


Fig. 11-2 Biopsy image

Exit Biopsy status:

Press [Puncture] key in the biopsy status again, or switch image mode, hiding the biopsy down-lead in the image windows.

Chapter 12 Save and recall

12.1 Introduction

Archive/ Recall system can store the frozen image and preset data into the memory, and provides the management function of data file, and through USB port to connect the external removable memorizer, to achieve massive storage.

Press □MEMORY□, □MEMORY□ key will be back-lit and a dialog box of Archive/ Recall is opened, see below:

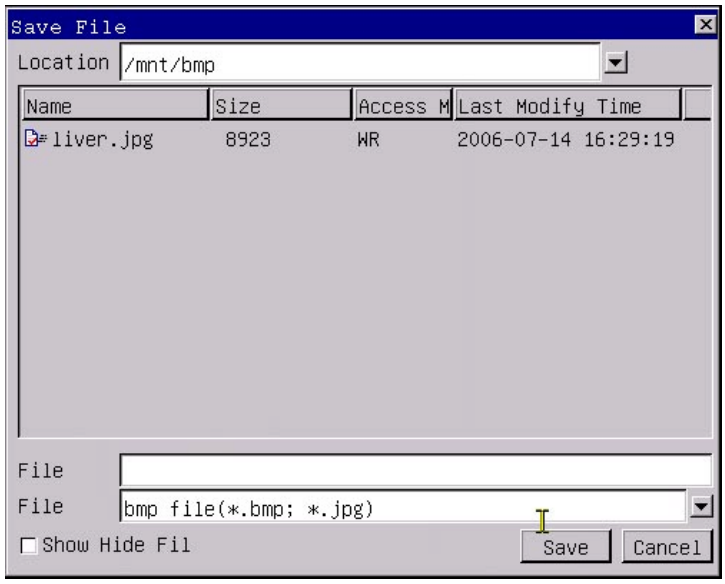


Fig. 12-2 Save image dialog box

Note: During storing, it is can't go along keyboard operating, including trackball and button

etc, otherwise it will affect the image effect of storing. Due to the unit's storage capability is

limited, the image format is JPG in the unit and is BMP format in the external memorizer.

12.2 Recall storage image

Recall storage image is only available at the frozen status.

When use external memorizer to achieve recall, the system default that the image file in the recall memorizer. If use current unit to recall images, it is essential ensure that no external memorizer.

Operation method:

1. Freeze the image.
2. Press□MEMORY□key and the dialog box of Archive/ Recall appears on the screen.
3. Select the [Recall BMP image], press □SET□key on the [OK] button, or press [MEMORY] key again, recall dialog box will appear, Press [OPEN] after select needed recall image file, and the system will be displayed the image of already storaged.

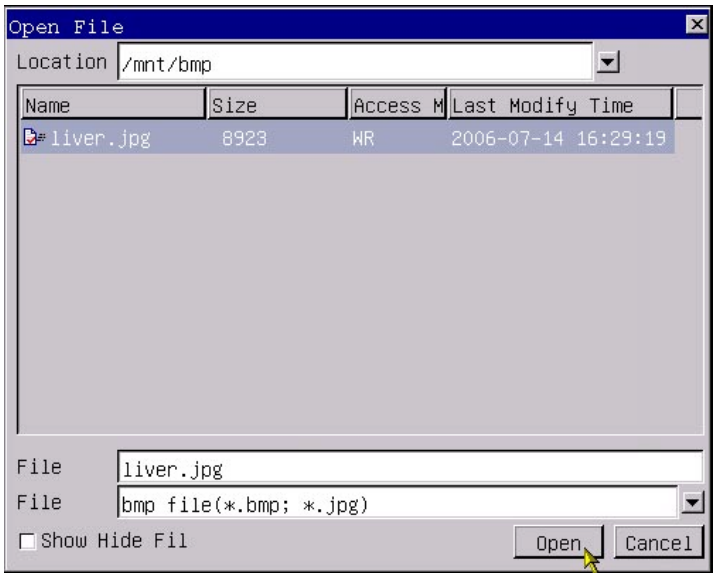


Fig. 0-1 Recall image dialog box

12□3 Store current patient information

To facilitate search and management by doctors, the system can store the following patient's information in the memory, including the current patient's diagnostic image (4 images Max.) patient's information, patient ID, exam No., patient name and age, examination date etc.

Method of operation:

1. Press□MEMORY□ key, the dialog box of Archive/ Recall appears on the screen.
2. Press □SET□key at front of [Store current patient information] to select this item. Press □SET□key after moving the cursor to [OK] button of dialog box. Then the dialog box will be closed and the information of the current patient will be stored in the memory automatically.

12□4 Recall the patient information

Function: recall the stored patient's information to the screen to facility of study by the doctors, the dialog box appears as follows:

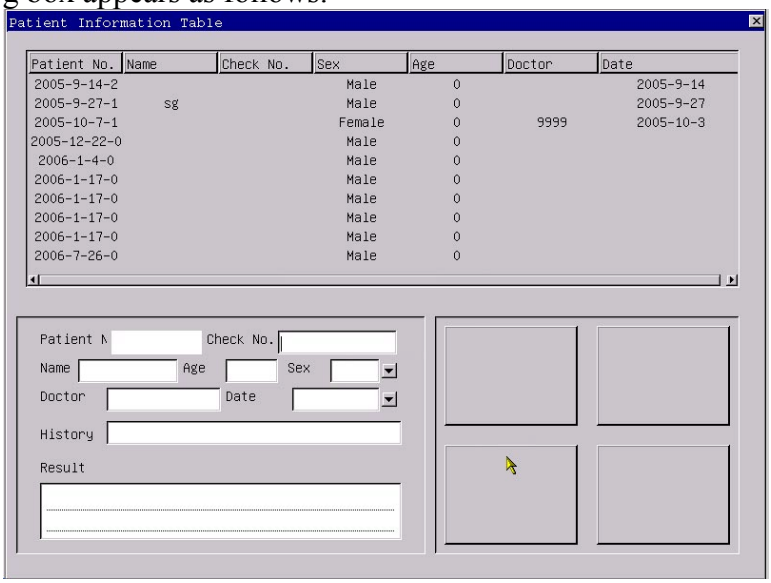


Fig 12-4 Dialog box of recalling the patient' s information

Method of operation:

1. Press□MEMORY□ key, the dialog box of Archive/ Recall appears on the screen.
2. Press □SET□key at front of [Recall patient information] to select this item. Press □SET□key after moving the cursor to [OK] button of dialog box. The dialog box of recalling patient information will appear, please see fig. .
3. Move the cursor to the required patient, press□SET□to confirm, and the patient details will be shown on the bottom of dialog box, including the diagnostic image. Click the image to zoom-in it, to exit the image display, press□SET□after moving the cursor on [Close] button or [×] at the right upper of dialog box.
4. Press□SET□after moving the cursor on [Close] button or [×] at the right of dialog box of Archive/ Recall to exit Archive/Recall status.

12 6 File management

File management can carry copy, affix and re-name for catalog, files which already saved.

The first it need select the path of files, or select the current disk or portable storage disk, if

no external memorizer, so the system default the current disk only.

Warning: when the external portable storage disk can not identify by the system, it can re-start machine, than the portable storage disk can identify.

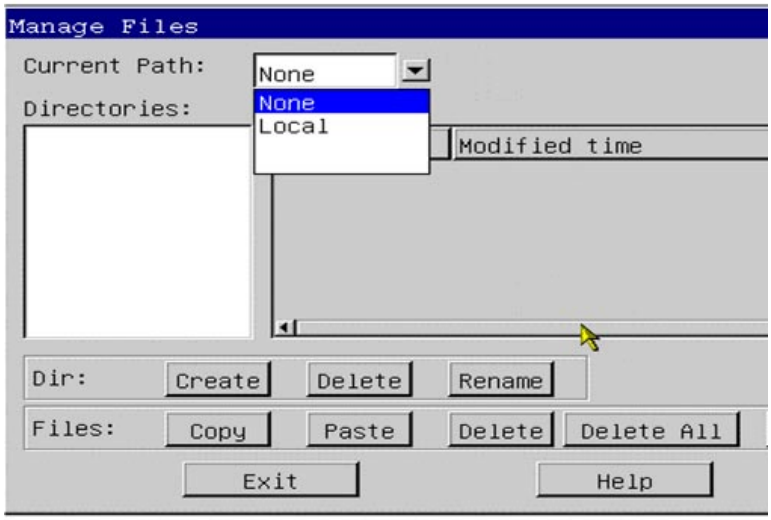


Fig. 12-5 Dialog box of path selection

12.6.1 Catalog management

Catalog management can operating for establish, delete and re-name etc.

Operation method:

1. The first select the needed catalog, and press □SET□key on the catalog, it will be displayed by high bright.
2. Move cursor to the wanted operation button, press □SET□key, the relevant dialog box will be appear.
3. Input the catalog name on the dialog box, then press □SET□key on the [OK] , or press □SET□key on the [CANCEL].

Fig. 12-6 Establish catalog dialog box

Fig. 12-7 Catalog re-name dialog box

12.6.2 File management

File management can operating copy, affix, delete and re-name for image files.

The operation method of delete and re-name is the same with catalog.

The operation method of copy and affix:

1. The first select the needed file, and press □SET□key on the file, it will be displayed by high bright.
2. Press □SET□key on the [COPY] button.

3. Select the needed affix target catalog, double click □SET□key to enter into this catalog,

then press □SET□key on the [AFFIX] button, the file will be affixed to target catalog.

Warning: it is can not affixed to the same catalog after copied file.

Chapter 13 Preset

This chapter introduces the operation to make settings of the system through preset menu at preset mode.

Preset function is used to set up working environment and status, parameters of each examination mode. The setting will be store in the memory of system and not be lost even after switching off. When turn on the machine, the system will work automatically with the status required by the operator.

13.1 Enter/Exit preset mode

In the real-time state, select [Preset] menu option in B,B/M,B/B mode. Press □SET□ to enter [PRESET] submenu. Shown as Fig13-1, the system enters into Preset mode.

Select the item listed on submenu to preset the corresponding parameters.

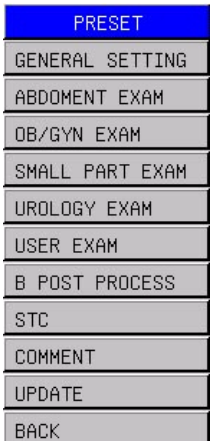


Fig 13-1 Preset menu

In preset mode, move the cursor to [Back] item, press□SET□, the preset menu will be closed, and the system will run according to the modified parameters.

Note: After enter into Preset, if it cannot do any other operation to the system, it must press □SET□key on the [BACK], and exit the Preset status to carry out.

13.2 General setting

Move the cursor to [General setting] menu option, press□SET□, the dialog box of general setting appears, shown as follows:

Fig 13-2 Dialog box of general setting

For the meaning of items in dialog box, please refer to the following sheet:

List 13-1 items listed in dialog box of general setting

Function	Setting method	Function description
Hospital	Input freely	Set up the hospital name shown in top left corner of the screen and the diagnostic report, 20 characters Max. can be input
Section office	Input freely	Set up the section office name shown in top left corner of the screen and the diagnostic report, 20 characters Max. can be input
Current date	Set up freely	Set up the system date (calendar format), select current date directly.
Current time	Set up freely	Set up the working clock of the system, format is hh/mm/ss
Language selection	Set up freely	Set up the current system language, it can choice the English or Chinese.
Screen savers	Set up freely	Set up the screen savers whether of not use, "√"is use, "□" is not use.

13.3Preset of exam mode

There are 5 exam mode used for Abdomen (normal), OB/GYN, cardiac, small parts, user-defined mode. A set of proper running environment has been set default for each exam mode. The setup content of each exam mode is similar. Take set up of OB/GYN exam mode for example:

In dialog box of OB/GYN exam-mode preset, 3 preset pages are available respectively for image parameters, probe parameters and calculation formula. Please see below:

13.3.1 Preset of parameters:

Move the cursor to "OB/GYBN " item in preset menu and press □SET□ to confirm. The dialog box of presetting OB/GYN exam mode will appear. The default displayed parameters preset page, dialog box will be display as follows:

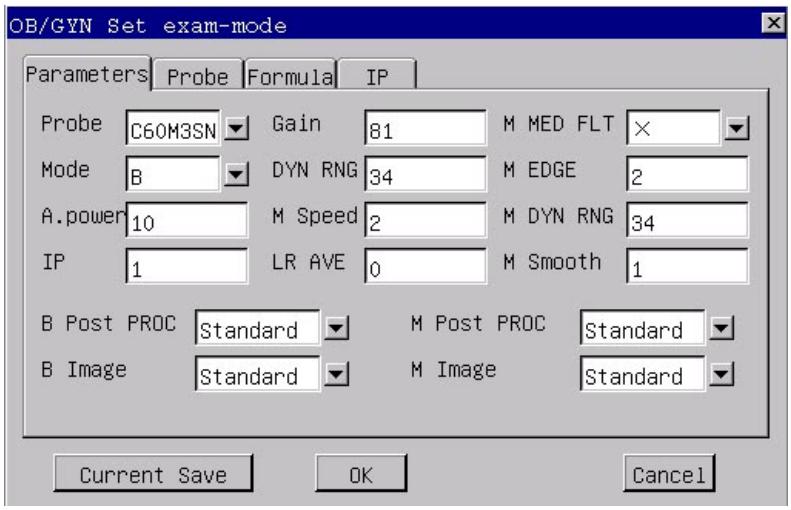


Fig 13-3 Dialog box for Preset parameters of OB/GYN exam mode

Presetting parameters listed on [Image Parameters] page is introduced as below:

List 13-2 Preset parameters page

Function Name	Setting Method	Function description
Probe	C60613S L40617S C12616S C20615S L74615S	Set the probe type to be used
Display mode	B, M, B/B, B/M	Set display mode
Acoustic power	0□11	Set acoustic power, totally 12 levels
IP	0□9	Set IP-parameters combination of image processing, totally 10 levels
Gain	0□99	Set B image gain, totally 100 levels
Dynamic range	30□90	Set image dynamic range, totally16 levels
M Speed	1□4	Set M mode scan speed
Linear correlation	0□1	Set image linear correlation
M median wave	√□×	Set the switch of M median wave
M Edge enhancement	1□3	Set image edge enhancement
M Dynamic range	30□90	Set image dynamic range, totally16 levels
M Smoothness	1□3	Set M mode image smoothness processing
B post processing	Standard, high level, low level, equal level and negative	Set B image post processing effect
M post processing	Standard, high level, low level, equal level and negative	Set M image post processing effect
B image effect	Standard, high level, low level, equal level and negative	Set B image post processing effect
M image process	Standard, high level, low level, equal level and negative	Set M image post processing effect

13.3.2 Preset of the probe

Parameters related to probes can be set up in [Probe] page.
The probe which the system practice used will preset on the parameter page.
To select “Probe” button, open the probe parameter preset page, see below:

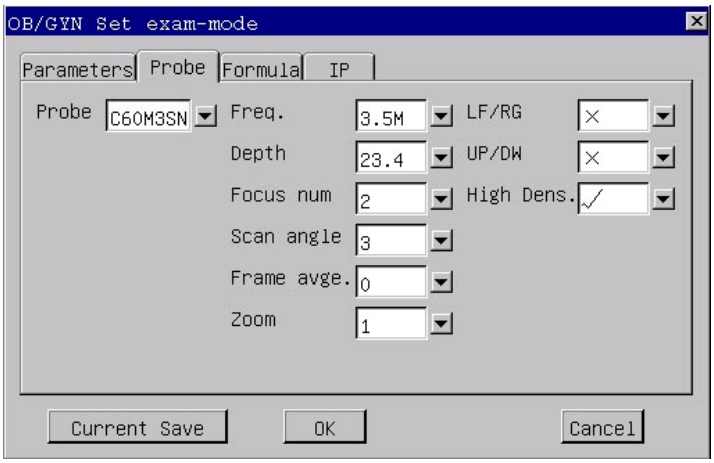


Fig 13-4 Dialog box for preset OB exam

The items on [Probe] page are described as below:

List 13-3 Preset parameters in Probe page

Function Name	Set up Method	Function description
Probe	C60613S L40617S C12616S C20615S L74615S	Related to probe type
Frequency	C60613S 2.5/3.5/4.0/5.0 MHz L40617S 5.0/6.0/7.5/9.0 MHz C12616S 4.5/6.0/7.0/8.0 MHz C20615S 3.5/5.0/6.0/7.0 MHz L74615S 3.5/5.0/6.0/7.0 MHz	Set probe frequency
Focus	1, 2, 3, 4	Set focus point No.
Scan angel	0, 1, 2, 3	Set scanning angel of the probe
Frame averaging	0, 1, 2, 3, 4, 5, 6, 7	Set frame averaging of the probe
Partial zooming	1□2□3□4	Set partial zooming of the probe
Left/right reverse	√, ×	Set Left/right reversing of image
Up/down reverse	√, ×	Set image Up/down reversing of image
High density	√, ×	Set ON or OFF status of high density

13.3.3 Set calculation formulas

Two kinds of OB calculation formulas can be preset: GA calculation formula and Fetal Weight calculation formula.

Move the cursor to [Calculation Formula] button and press [SET] key to open the Calculation Formula page, see below:

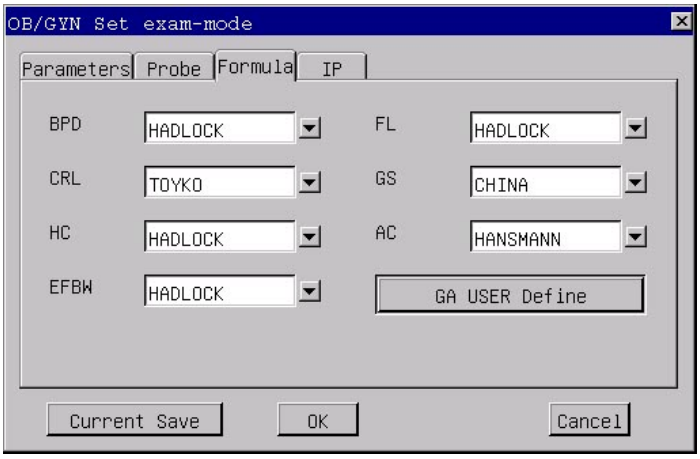


Fig 13-5 Dialog box for preset calculation formulas

The items of dialog box for presetting Formulas are described as below:

List 13-4 Setup calculation format

Measurement item	**Formulas to be selected**
BPD	Tokyo University / HADLOCK / China / GA-USER
CRL	Tokyo University / China / GA-USER
HC	HADLOCK / Hansmann / GA-USER
FL	HADLOCK / China /Hansmann/GA-USER
GS	Tokyo University / China / GA-USER
AC	HADLOCK / Hansmann / GA-USER
Fetal Weight	Tokyo University / Osaka University / HADLOCK

Setup of user-defined formulas is suitable to different people, see the edit interface as below fig.:

1. Move the cursor to the [GA-USER] press SET key to enter the edit interface of GA USER.
2. Move the cursor to the required user-defined value at the right of the data list, press SET to light the data item. 3 parameters will show at the left of the dialog box , the parameters of Week/ Day can be modified.
3. After modifying the parameters of Week/Day, fix the cursor to [Modify] button and press SET to confirm the modification.
4. Move the cursor to [Exit] after complete modification, press SET to quit from the edit interface. When user-defined formulas are selected later, the system will recall the user-defined parameters according to the modified values.
5. When do not want to modify any parameter, press SET key on the [Quit] button directly.

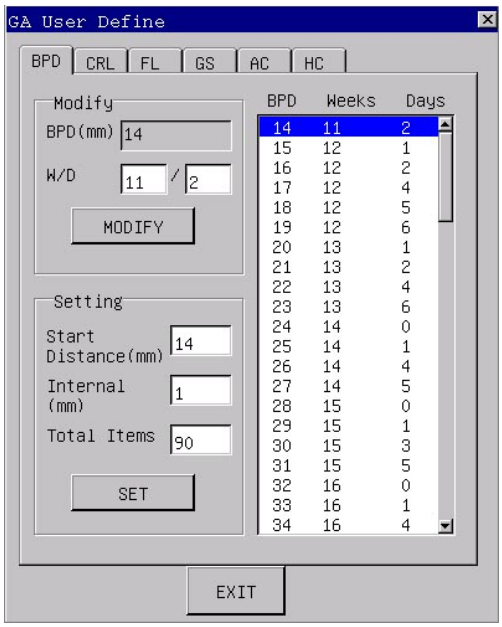


Fig 13-6 Edit interface for user-defined formulas

Caution: The page of presetting Calculation Formulas is only available in dialog box of OB/GYN exam mode.

13.3.4 Preset of IP

IP page used to setting the idiographic IP parameters.

To select□IP□page button, open the preset page of IP parameters, see below:

Setting page	Parameters selection
Dynamic scope	30□90□16levels
Edge enhancement	0□1□2□3
Smoothness process	0□1□2□3
Frame correlation	0□7□8levels

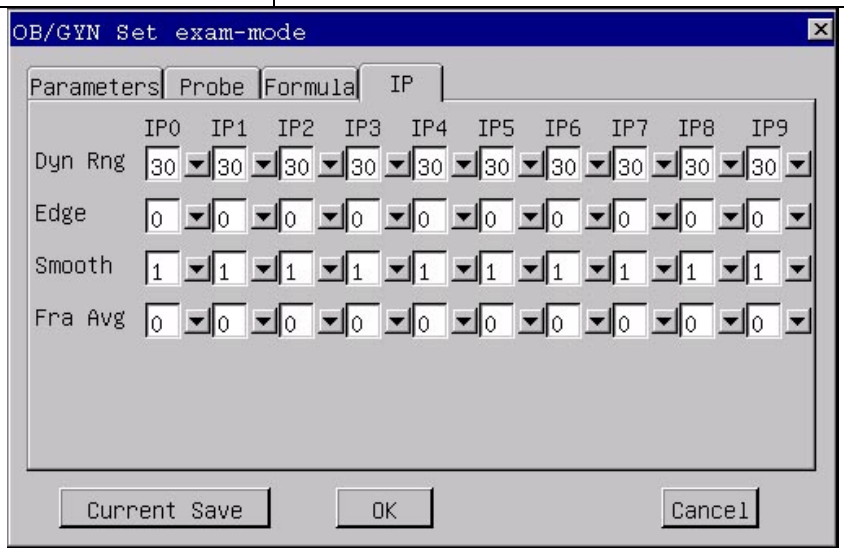

OB/GYN Set exam-mode
Parameters
Probe
Formula
IP
IP0 IP1 IP2 IP3 IP4 IP5 IP6 IP7 IP8 IP9
Dyn Rng 30 30 30 30 30 30 30 30 30 30
Edge 0 0 0 0 0 0 0 0 0 0
Smooth 1 1 1 1 1 1 1 1 1 1
Fra Avg 0 0 0 0 0 0 0 0 0 0
Current Save
OK
Cancel

Fig 13-7 IP setting page of OB exam preset dialog box

13.4Preset of post processing

Preset of post processing is used for set up of parameters and curves of image post processing. In post process setting, gray transformation curve, gray rejection curve andγcorrection can be set.

Preset operation:

In B, B/B, B/M mode at real-time status, move the cursor to [B post processing] item and press□SET□to confirm. The dialog box of presetting post process appears, set below:

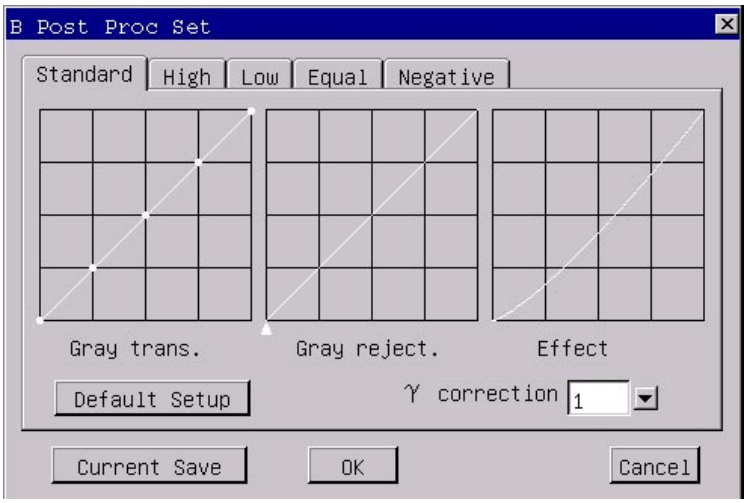


Fig 13-8 Dialog frame for preset post process

There are 5 page of the dialog box for setting up post process parameters: standard, high level, low level, equal level, negative. The items and operation on each page are the same.
Take [standard] page for example:

Caution: The actual curve and the parameters of post processing can be set in [parameters] page of dialog box of presetting exam-mode.

13.4.1 Gray scale transformation curve

Adjustment method:

There are 5 round adjust point in the gray scale transformation curve, which can be used to adjust the shape of the curve.

1. Move the cursor to the point in the gray scale transformation curve, and the cursor changes into"✣".Press□SET□ and then move the trackball to adjust the curve. Then press□SET□ again to finish the adjustment on this point. Use the same way to adjust the other point on the curve.
2. Or press [Record current value] button to set the curve: press□SET□on the button of [Record current value], the curve will be set to the current gray scale transformation curve of image post processing, and the current gray scale rejection curve andγ correction will be loaded into the current page of dialog box.
3. Move the cursor to the [set default] and press□SET□□the gray scale transformation curve will change to a beeline with 45°angel.
4. Press□SET□ on [OK] button to save the modification, or press [CANCEL] to give up modification and close the dialog box.

13.4.2 Gray scale rejection curve

There is a trigon point in the curve used for adjusting gray restrain of the curve.
Adjustment method:

1. Move the cursor to the trigon point of the gray scale rejection curve, and the cursor changes to"✣". Press□SET□ and then turn the trackball to move the adjustment point to adjust the curve. Then press□SET□ again to finish the adjustment of the curve.

2. Or press [Record current value] button to set the curve: press□SET□on the button of [Record current value], the curve will be set to the current gray scale rejection curve of image post processing, and the current gray scale transformation curve andγ correction will be loaded into the current page of dialog box.
3. Press□SET□ on [OK] button to save the modification, or press [CANCEL] to give up modification and close the dialog box.

13.4.3 γcorrection

The parameter values forγcorrection are divided into 4 steps: 0,1, 2, 3, which respectively representsγcoefficient 1.0, 1.1, 1.2, 1.3.

Adjustment method:

1. Select the corresponding parameter in the [γcorrection] submenu and press□SET□to confirm. Then effect curve changes accordingly
2. Or press [Record current value] button to set the curve: press□SET□on the button of [Record current value], the value ofγcorrection will be set to the current γcorrection of image post processing, and the current gray scale transformation curve and rejection curve will be loaded into the current page of dialog box.
3. Press□SET□ on [OK] button to save the modification, or press [CANCEL] to give up modification and close the dialog box.

13.5Preset STC

Every probe has its own separate STC preset curve with the special transmitting frequency. There are 6 pages on the dialog box according to 6 kinds of probe available. User can choose the corresponding STC preset curve according to the different transmitting frequency of the probe.

Move the cursor to the [STC] menu option on preset menu, and the dialog box of STC preset will appear. See below:

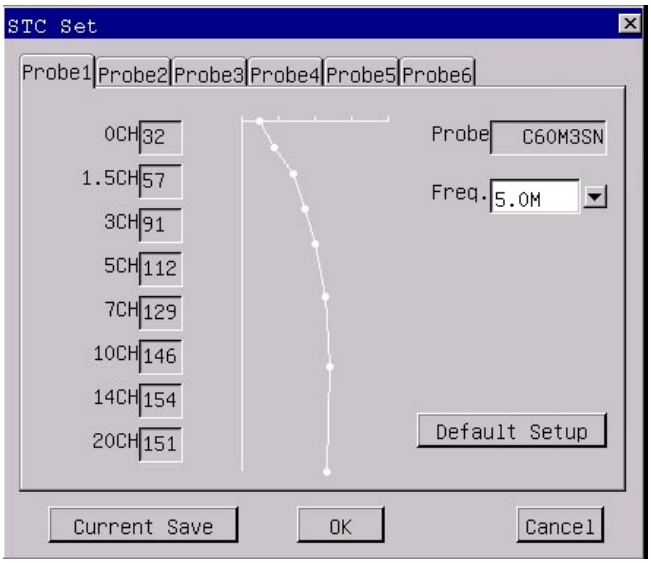


Fig 13-9 Dialog box of STC preset

Operation:

The way to preset STC curve on each page is same, and now take the preset of Probe1□C60613S□for example:

1. At image display mode, select Probe C60613S and the required transmitting frequency 2.5MHZ in the image mode, adjust STC slide to the appropriate value.
2. Enter into the preset mode and open the dialog box of STC preset. Select the corresponding page for set up of probe C60613S.

3. Move the trackball to the Frequency menu, select the required probe transmitting frequency for preset-2.5MHZ.
4. Press [Record current value] button□STC curve is set as the adjusted curve at step 1, at the same time, Gain value of each point of 8 STC slide will be displayed in the text at the left of the STC curve.
5. If press□SET□on the [set to default] button, STC curve and the Node Gain will be shown in the left as the default setting of factory.
6. Press □SET□on the [OK]to save the modification. Press □SET□on [Cancel]or [×] to give up the modification and close the dialog.

Caution: The STC curve is corresponding to the probe and its transmitting frequency, Otherwise, it is not valid to press [Record current value] button on dialog box.

13.6Set annotation database

Classification of the preset annotation database: Abdomen, OB, GYN, Cardiac, Small parts, Pathological. Every category has many in-built annotation term before delivery. Users can add or delete user-defined annotation term.

Press [Annotation database] item on [Preset] menu, and there is the dialog box for annotation database setting, see below:

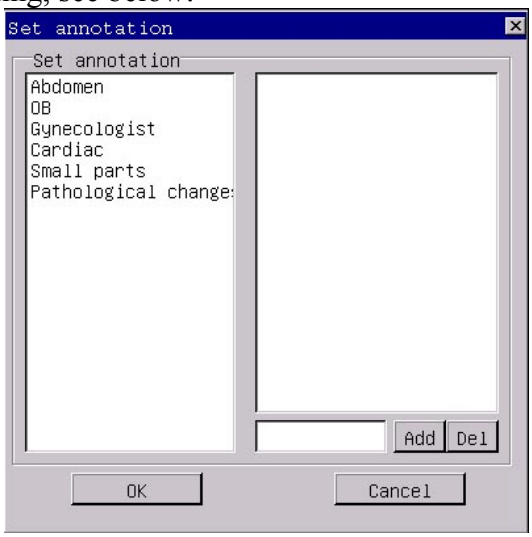


Fig 13-10 Dialog box for annotation setting

Add or delete user-defined annotation in annotation database:

Add annotation term:

1. Select one of the modes in the left side frame, then all the annotation phrases for selected mode will be displayed.
2. At this moment, move the cursor to the lower right small frame beside [add/delete], press □SET□ key, and the cursor changes to "|", input the new added annotation phrase through keyboard.
3. After the inputting is finished, move the cursor to "Add" button and press □SET□ key to confirm the adding new phrase.
4. Move the cursor to "Confirm" and press □SET□ to store the modification; Move the cursor to [Cancel]or [×] and press □SET□to give up modification, and close the dialog at the same time.

Delete annotation term:

1. Select one of the modes in the left side frame, then all the annotation phrases for selected mode will be displayed.
2. At this moment, select one phrase to be deleted in the right side frame, and this phrase will be lit brightly.

3. and move the cursor to “Delete” button and press □SET□ key to confirm the deleting of the selected phrase.
4. Move the cursor to “Confirm” and press □SET□ to store the modification; Move the cursor to [Cancel]or [×] and press □SET□to give up modification, and close the dialog at the same time.

Chapter14 Reports

Summarize

Reports function is used to store, print the patients examination report, to examine and manage the patients information by doctors conveniently.

Report forms including the normal examination reports, OB examination diagnosis reports, cardiac examination diagnosis reports, urology examination diagnosis reports and GYN examination diagnosis reports. The report menu is below:

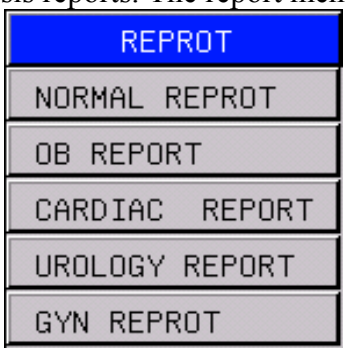


Fig. 0-1 Report function

Enter into report model, press □REPORT□key, the report menu will appear, select needed examination report menu item, press □SET□key to enter into report editing model, see below.

Report interface

Take the normal examination report as a example to explain the method of use report , The normal examination report interface as follows. Report interface include patients and hospital, the details of patients, the doctor can carry out explain against the state of an illness of patients depends on clinic diagnosis and ultrasound showing. Press □SET□key on the [OK] or [×] on the dialog box to exit the report interface.

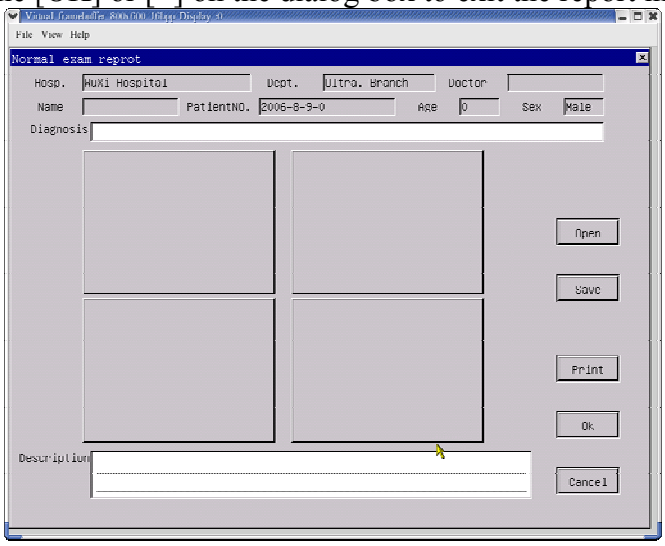


Fig. 0-2 Normal examination report interface

Image input

See above picture, there are four frames in the report page, and press □SET□key on the any image frame, appear a opened file dialog box, press [Open] after select the relevant image file, the picture will be inputted to image frame.

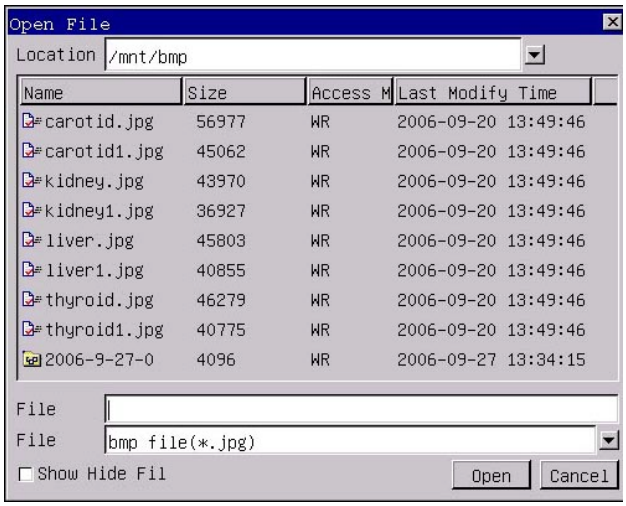


Fig.14-3 The dialog box of open image

Print image

The first, select the number of needed print image at the left of image, then press □SET□key on the [Print] button, and the image and patient data will be printed. Caution: if only need to print one image, set the number of do not need print image as "0"when select.

Save, open and input of report file

User can use the functions of save report to save the diagnosis report. User for image input of patient, press □SET□key on the [Save] button after diagnosed, the dialog box will be appeared, press □SET□key on the [Save] button after file named, the patient report will be saved to relevant directory.

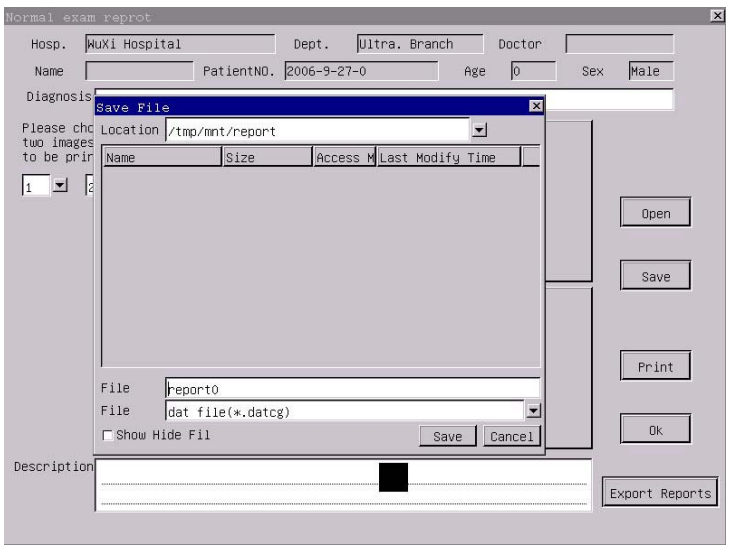


Fig 14-4 The dialog box of report page save

If user need to open already saved report page file, press □SET□key on the [Open] button, the report page file dialog box will open, then select relevant file, press □SET□key on the [Open] button to open report page.

If the unit have external USB disk, it can use report page file to output functions, ie report page file output to external USB disk, saving memory space, also easy to store data for user.

Chapter 15 System Maintenance

15.1 Clearance of the system

Caution Please make sure that the power is turned off and the power cord is disconnected from the socket before clearing the system. There will be danger of electricity shock if clearing the system in Power On status.

The method of cleaning control panel, outer-frame, probe holder and monitor:

Please use a piece of soft and dry cloth to clean the machine. If the machine looks relatively dirty, add some water into the cloth, then use the wet cloth to clear the machine. After the dirt is cleared, then use the soft and dry cloth to wipe the machine and make it dry.

Caution:

1. Please not use alcohol and other organic solvent to clean the probe, otherwise it will destroy the probe surface.

2. Please never splash any liquid directly into the system, otherwise it will result in the danger of electricity shock or malfunction of the system.

2. If there is need to clean probe connector, STC slide or any other peripheral, please contact our authorized agent in your country. Doing any clearance by yourself may result in malfunction or lower the performance of the system.

15.2 Maintain probe

The probes used on the system may be divided in two series: for body surface and for transvaginal use.

Please try to decrease the irradiation of ultrasound wave on the body during the ultrasound examination

aution

(1) Probe can only be used by professionally trained operator.

(2) Probe cannot be sterilized and disinfected by autoclave. If need to be used in sterilized occasion, the probe should be covered by one-off sterilized probe cover.

(3) Try to avoid dropping down the probe or knocking the probe.

(4) Don’t let the probe surface scratched during use.

(5) Don’t curve or tightly pull the power cord of the probe.

(6) Keep the probe clean and dry.

(7) Connect or disconnect the probe in power off status.

(8) Do not use or preserve the probe under the environment of over temperature 50□

(9) If there is any abnormal phenomenon with the probe, please stop using it immediately and contact our authorized agent in your country.

Clean the probe:

The procedure of cleaning the probe is applicable to all the probes. All the probes should be cleared according to the procedure stipulated in this Chapter after the usage of probes is finished. For transvaginal probe, it should be sterilized according to the usage status.

Steps of cleaning the probe:

(1) Clear the residual gel or stained point on the probe tip by flowing clean water. Don't splash the water or other liquid on cable and connector of the probe.

(2) Then use the wet sponge or soft cloth and little liquid soap to clean the probe tip. Don't use corrosive detergent or cleaner.

(3) Clean the probe tip again by flowing clean water completely. Then use the cloth soaked by 70% isopropyl alcohol solution to wipe and make sure there is no dirt on the probe.

(4) Wipe the probe and make it dry by soft and clean cloth.

Caution For probes used for body surface, do not immerse its surface into the liquid with the depth exceeding the acoustic lens. For the transvaginal probe, do not exceed the inset area. It is forbidden to immerse the connector of the probe into any liquid.

Disinfection and Sterilization:

The procedure of disinfection and sterilization is applicable to the transvaginal probe. If there is need to use the probe during the operation, please do the sterilization according to the instruction of professional disinfector.

Process of disinfection and sterilization:

1. Clean the probe according to the cleaning process.
2. Prepare 2% glutaraldehyde solution for disinfection and sterilization according to the instruction of manufacturer.
3. Immerse the insert area of the probe into the sterilization solution, immersing depth can not exceed the insert area. Do not splash any liquid to the connector of the probe.
4. Dip the probe for 3 hours.
5. Use the asepsis water or asepsis brine to rinse the probe completely after taking it out of sterilization solution. To make sure there is no solution left on the probe, do the correct rinsing process according to the instruction of manufacture, including ensure of the rinsing water and rinsing number.

6. If the probe is needed to be used in sterilized occasion, it should be covered by one-off sterilized probe cover.

Caution:

1. **Do not immerse the connector of probe into any liquid.**
2. **Do not immerse the transvaginal probe into the liquid with immerse depth exceeding the insert area.**
3. **Dipping the probe for 12 hours is strongly prohibited.**
4. **Only the qualified sterilization solution can be used for disinfection and sterilization.**

Preservation:

1. Please keep the probe away from direct exposure to sunlight and high temperature. 2. Keep the probe in environment with temperature between –10~50□. Do not preserve the probe in the environment with high pressure or vacuum.

3. Be careful when you preserve or take out the probe to avoid any damager.

4. Please keep the probe inside the metal probe case when it is not in use or during transportation.

15.3 Safety check-up

To ensure the system work normally, please draw the plan for maintenance and check-up, check the safety of the system periodically. If there is abnormal phenomenon with the machine, please contact our authorized agent in your country.
If there is no image or menu on the screen or other phenomenon appears after switching on the machine, please do as follows, please do the troubleshooting first according to the following checking list. If the trouble is still not be solved, please contact our authorized agent in your country.

15.4 Troubleshooting

The most frequently occurred errors, system messages, their possible causes and solving methods are listed below:

Errors & Messages	Possible Cause	Solution
When starting the system, power-indicating lamp is not lit.	Power cord might not be well connected to the electricity power socket.	Check the power system and power cable, to ensure well.
When starting the system, power indicating lamp is lit, but no images on the monitor..	1) Restart the system too shortly after switching off. 2)Improperly adjusting brightness and contrast of monitor.	1) Wait for 1 minute to restart the system after switching off. 2) Appropriately re-adjust brightness and contrast of monitor.

Menu bar displays on the screen but no scanning image	1. Beam power, gain or STC control is not set correctly 2. No probe is connected or probe is connected improperly 3. the system is at frozen status	1. Adjust beam power, gain or STC control 2. Ensure the probe is connect correctly 3. Defreeze the system
Image quality is abnormal	1. Exam mode is not correct 2. Image post processing parameters are set improperly	1. Set the exam mode correctly 2. Adjust the setting of image post processing or set it to default setting